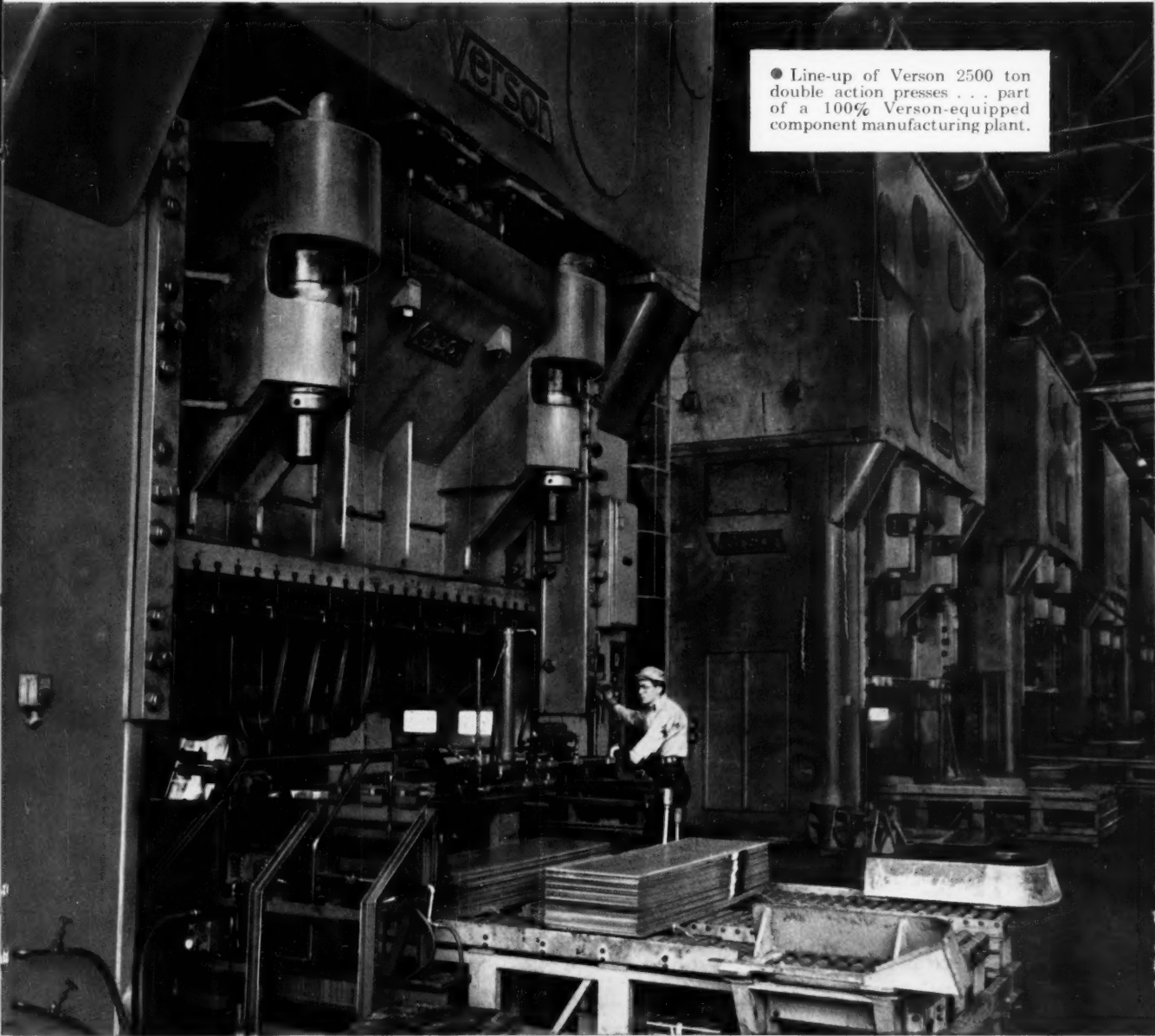


AUGUST 1955—SIXTY-FIRST YEAR

MACHINERY



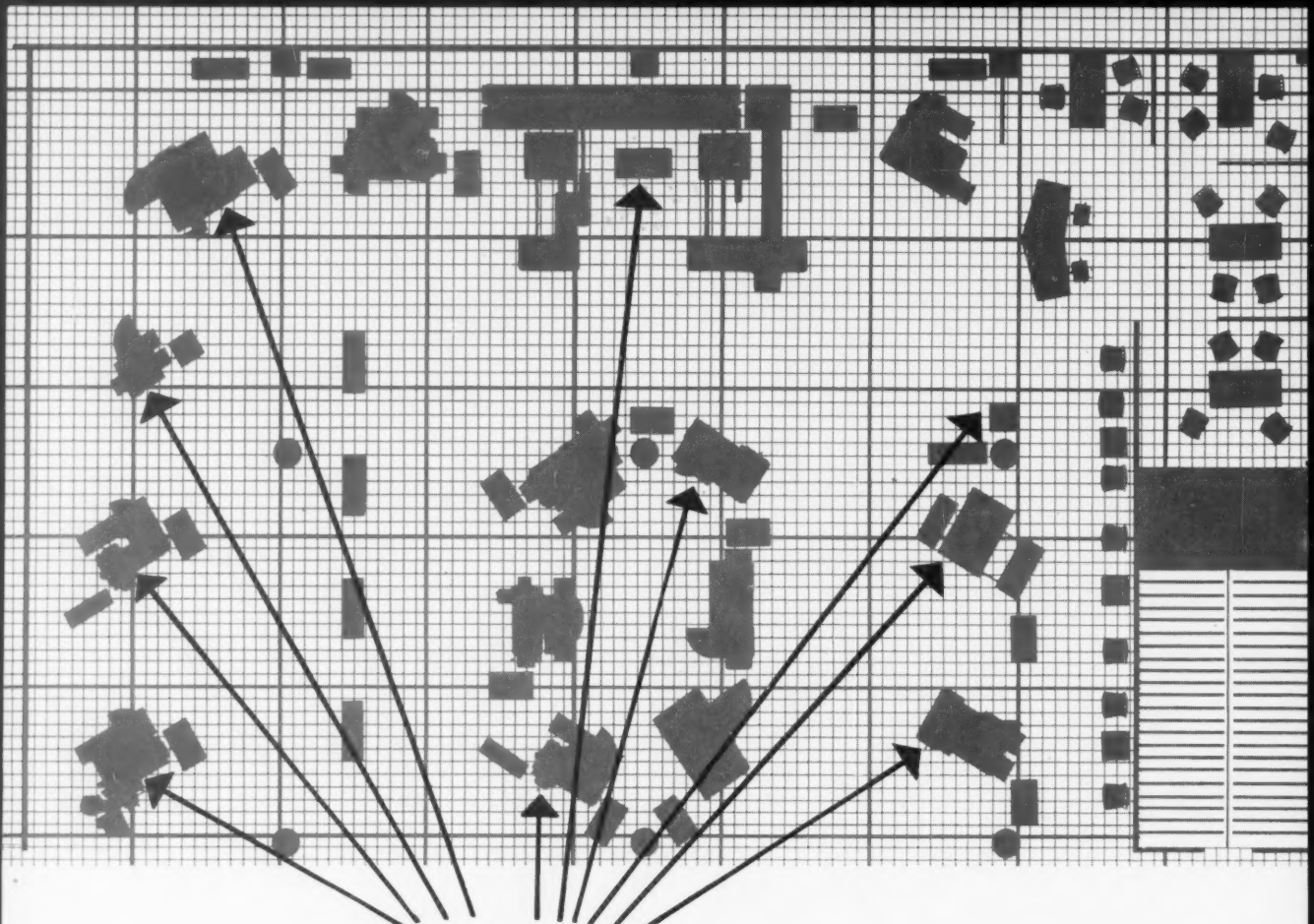
● Line-up of Verson 2500 ton double action presses . . . part of a 100% Verson-equipped component manufacturing plant.

Anyone can build a press.....



builds production processes

VERSON ALLSTEEL PRESS COMPANY • CHICAGO and DALLAS



these **new** Heald developments
are **TOP SECRET** now

THE SIXTEEN Heald machines shown in the above floor plan of Booth 902, represent the very latest advances in modern precision-finishing methods and equipment.

Some of these machines are completely new—never before shown to the industry. Others demonstrate outstanding new developments and improvements that will mean faster, better production of precision-finished parts. All machines will be in operation, on appropriate work.

Here you will see new machines with mechanical cycling—new automatic sizing methods—new self-adjusting grinding cycles—new wheel dressing procedures—new after-gaging and feedback systems—a fully automated multi-unit borizing setup—and a completely new angle in Bore-Matic design.

This is real progress in precision finishing—progress that means a new, higher return on “the world’s best investment, in action”.

*...but you are invited
to see them all,
IN ACTION,
in Booth 902
at the Machine Tool Show*

IT PAYS TO COME TO HEALD

THE HEALD MACHINE COMPANY
WORCESTER 6, MASSACHUSETTS

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York



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MACHINERY

VOLUME 61

AUGUST, 1955

NUMBER 12

**The Monthly Magazine of Engineering and Production
in the Manufacture of Metal Products**

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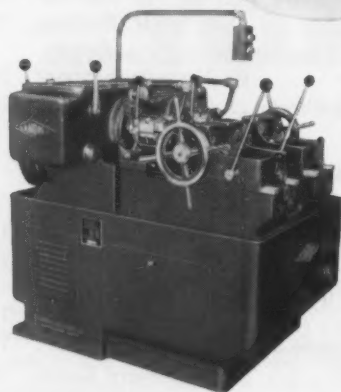
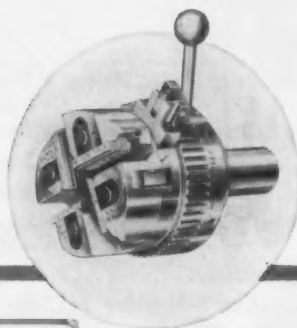
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**THE
MACHINE TOOL
SHOW
BOOTH
1406**

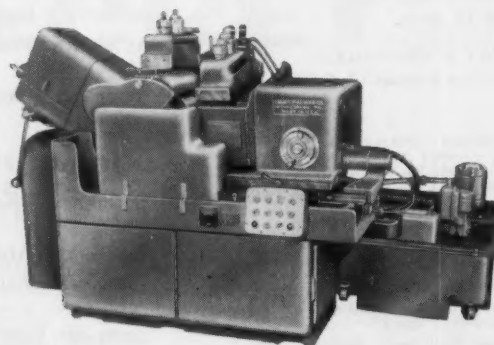


Cutting, Grinding, Tapping,



Cutting....

The 8C LANDMACO—one of five new Thread-Cutting machines to be demonstrated. These machines are designed for precision threading of workpieces from 3/16" to 6-5/8" in diameter. Above is the new 2" LANDMATIC—one of the many Standard and Special Thread-Cutting Heads on display designed for application to Automatics and Turret Lathes.



Grinding....

The CENTERLESS Thread Grinder—to be shown in operation—for infed and thrufeed grinding of threads for 1/16" to 4" in diameter at mass production rates.

Rolling THREADS

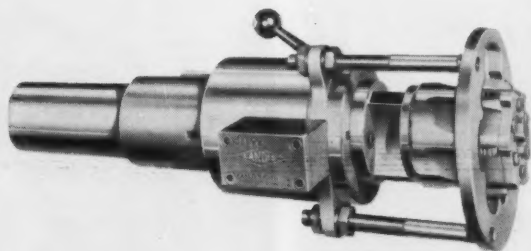
The latest Machines and Tools for producing threads by all of these methods will be shown—set up for operating demonstrations.

Most of these will be on display for the first time—the revolutionary LANHYROL Thread Rolling Machine, the new Model C LANDMACO Bolt Threading Machines, and the #1 Automatic Close Nipple Machine.

Experienced Thread Engineers will furnish any information desired about the more than 350 sizes and styles of LANDIS Threading Tools and Machines, and will be glad to discuss any problem dealing with method, equipment, or thread design.

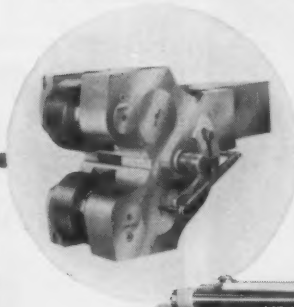
LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.



Tapping....

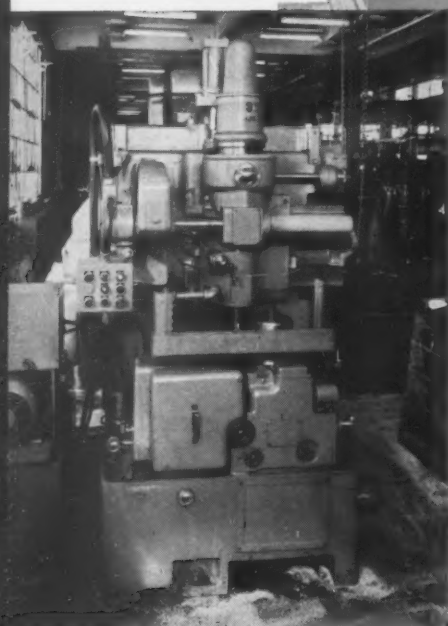
The LL Collapsible Tap for producing internal tapered threads featuring detachable heads for wide range coverage. On display will be Rotary or Stationary Standard Taps for straight or tapered threads. Solid Adjustable Taps, Valve Taps, and Taps for other special applications.



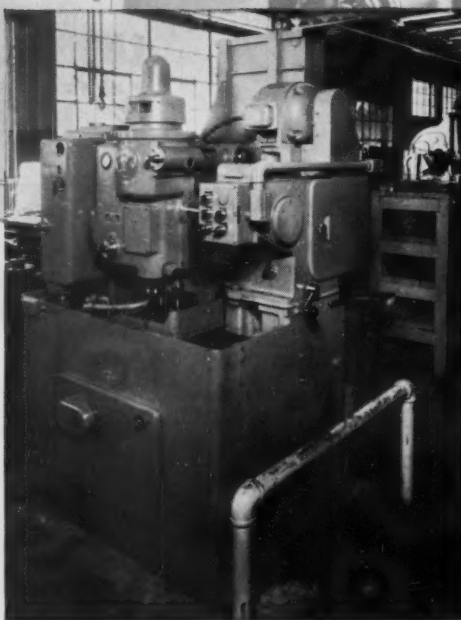
Rolling....

The new LANHYROL Thread Rolling Machine—shown in a variety of demonstrations—revolutionary in its output, accuracy, and flexibility. Above is the #20 LANROLL Attachment—one of five sizes of Thread Rolling Attachments for Automatics and Turret Lathes to be displayed.

THE BULLARD COMPANY tools-up



New HEAVY DUTY Fellows No. 12
Gear Shaper for internal or external
gears up to 12" p.d. x 4" face.
44 to 550 strokes per minute.



New HIGH-SPEED Fellows No. 4GS
Gear Shaper for internal or external
gears up to 6" p.d. x 2" face.
98 to 635 strokes per minute.

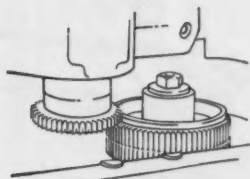


THE

Fellows

with FELLOWS

new "heavyweights"

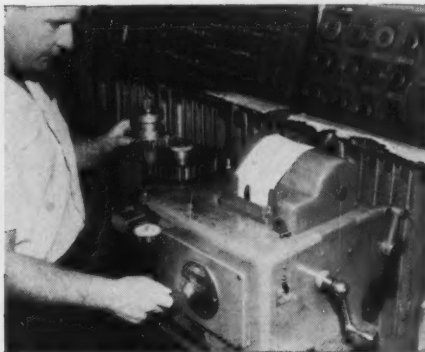


When Bullard needed more spur and helical gear cutting capacity at their big Bridgeport plant, they looked to Fellows' NEW HEAVIER DUTY MODELS.

A NEW NO. 4GS and a NEW NO. 12 have been added to Bullard's two 36-Types—giving them maximum output capacity per unit of floor space—and size capacities for all the spurs and helicals in their modern Mult-Au-Matics, Horizontal Boring Machines, Cut Master and Man-Au-Trol Vertical Turret Lathes.

All three types of Gear Shapers in this battery have a wider range of speeds and feeds than previous models. They hold to closer tolerances while taking heavier cuts—and consequently produce more gears at a lower cost.

These new-model Gear Shapers have a cost cutting potential for any shop involved in heavy production schedules. The nearest Fellows Branch Office will be glad to estimate the possible savings on your gears—and present the Fellows Plan to those who may wish to consider term payments.



← **ALL-PURPOSE Fellows 36-Type**
Gear Shapers for internal or external
gears up to 36" p.d. x 6" face.
18 to 300 strokes per minute.

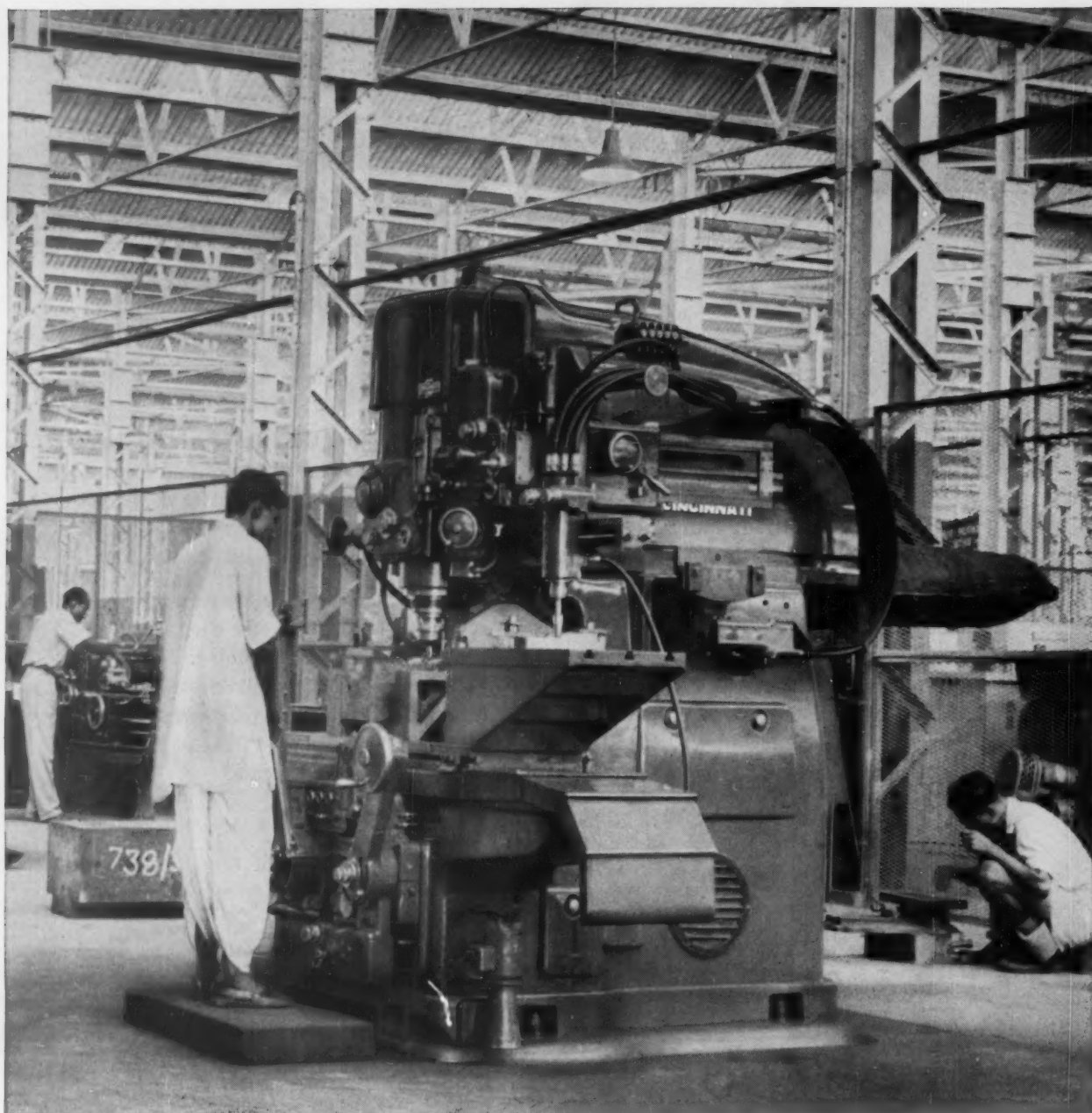
← Bullard Company also relies on
Fellows "Red Liners", Lead
Measuring and Involute Inspection
Instruments for CHART-RECORDED PROOF
of gear accuracy to keep costs and
quality under constant control.

GEAR SHAPER COMPANY

Head Office and Export Department: 78 River Street, Springfield, Vermont.

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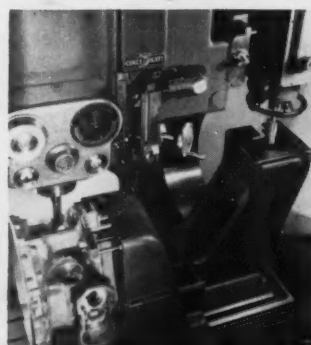
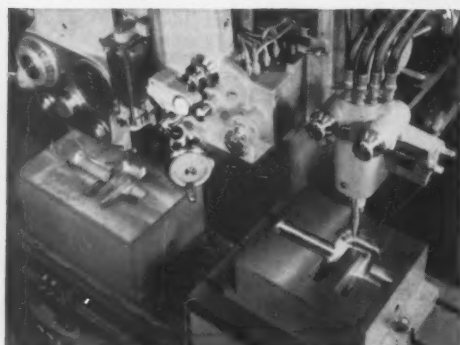
2206 Empire State Building, New York 1 • 6214 West Manchester Avenue, Los Angeles 45



Equipped with automatic depth control for Die Sinking

Equipped for 360° Automatic Profiling

Equipped for Combination Die Sinking and 360° Automatic Profiling



In Shops Everywhere Cincinnati Hydro-Tel Milling Machines are Preferred . . .



CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING
MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

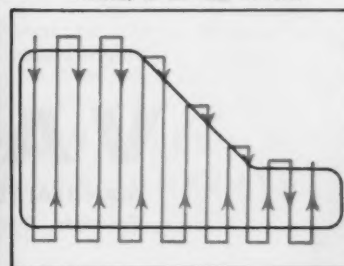
Equipped with **Multiple Spindle Heads** . . . a desirable Hydro-Tel feature for extra production



Equipped with **Automatic Feed Cycle**, including pick feed to table . . . a desirable feature for automatic die sinking

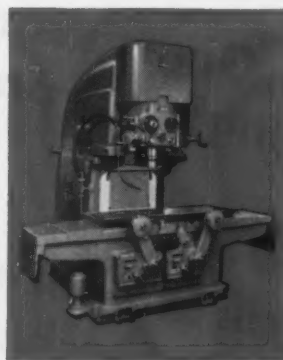


Automatic Feed Cycle Diagram.
"Short stroke" button enables operator to reverse cutting stroke, if desired, to suit die contour.



Reliability looms large in machine tools. It's an especially valuable asset when machines are installed thousands of miles away from home base. Government officials of one country half-way around the world had reliability in mind when they selected the CINCINNATI 16" Vertical Hydro-Tel Milling Machine, illustrated on the opposite page, for one of their railway shops. Other Hydro-Tel advantages of value in shops next door or in India, include a high degree of versatility . . . smooth accurate cutting . . . easy, comfortable operation . . . low maintenance costs . . . automatic, faithful duplication of die impressions (when equipped for this type of work). ¶ CINCINNATI 16" Vertical Hydro-Tel Milling Machines offer top value for shops of all sizes concerned with low-cost milling operations within 5 hp cutting capacity and 30" x 16" x 10" traverse movements. May we give you more information? Complete data in catalog No. M-1497-1, and brief specifications in Sweet's Machine Tool catalog.

**THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO**



**CINCINNATI
16" VERTICAL
HYDRO-TEL**

This illustration shows basic machine for tool-room vertical milling operations. Catalog No. M-1497-1.



**EXTRA!
EXTRA!**

VAN NORMAN ANNOUNCES
New Ram Type Miller No. 16S
Features
QUILL Adjustable CUTTERHEAD
Gives Work-Ability of Two
Single Purpose Milling Machines...

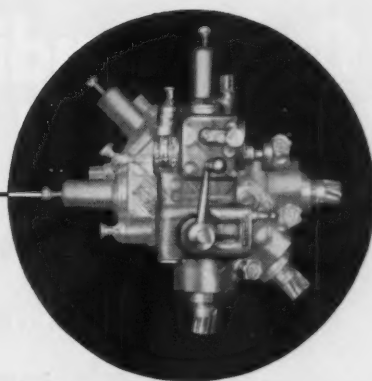
PLUS...
Accurate Boring and Drilling with the
Same Machine without Attachments

Don't wait . . . for extra profits install a Van Norman now!
They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export

VAN NORMAN

MANUFACTURERS of—Ram Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.



Quill Adjustable Cutterhead makes the No. 16S the most Versatile Miller Available

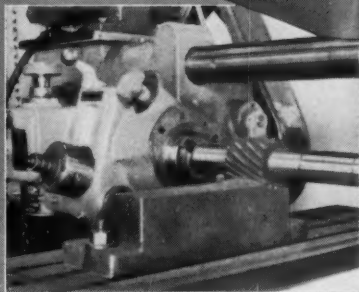
Permits Horizontal, Angular and
Vertical Milling, Boring and Drilling
on ONE MACHINE.

Phone, wire or write for more informa-
tion and catalog giving complete details.

No. 16S...

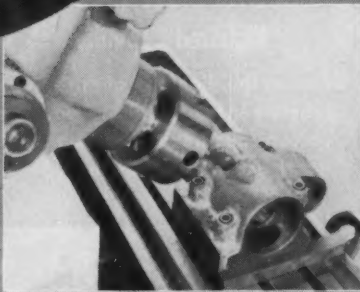
4" Quill Travel; 3 Quill Feeds; .0015,
.003, .006; 8 Spindle Speeds; 110 to
3600 RPM; Table Size 40½" x 10";
Cutterhead Spindle Motor 2 HP

HERE'S HOW IT WORKS...



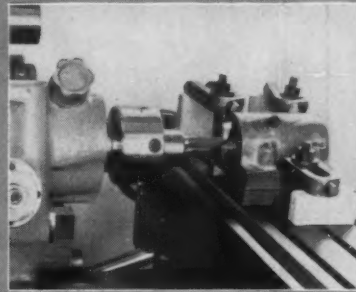
A HORIZONTAL MILLING

A horizontal milling cut per-
formed on a cast iron base. Width
of cut 2¼"; Depth .25"; 3" wide
helical slab milling cutter; Speed
110 RPM; Feed 6 IPM.



ANGULAR BORING

Angular boring on a cast iron
saddle bracket boring a 1" dia.
hole. Depth of bore 1¼" remov-
ing ⅛" stock on roughing cut.
Finish cut removes .010"; Tol-
erance on I.D. .001".



HORIZONTAL COUNTER BORING

Horizontal counter boring opera-
tion of a 3" dia. hole on same
saddle bracket. Depth of cut 1"
to a shoulder removing approxi-
mately ⅛" on rough cut. Finish
cut .010"; tolerance on I.D. .001".

COMPANY

**SPRINGFIELD 7,
MASSACHUSETTS**



**EXTRA!
EXTRA!**

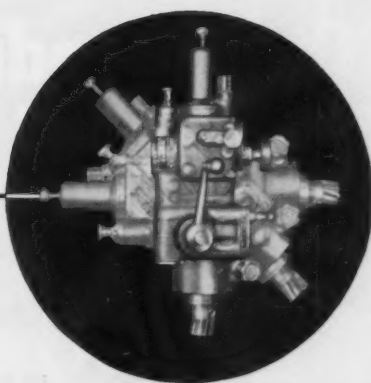
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PLUS...
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Don't wait . . . for extra profits install a Van Norman now!
They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export

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Quill Adjustable Cutterhead makes the No. 16S the most Versatile Miller Available

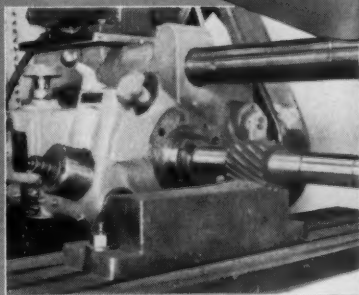
Permits Horizontal, Angular and Vertical Milling, Boring and Drilling on ONE MACHINE.

Phone, wire or write for more information and catalog giving complete details.

No. 16S...

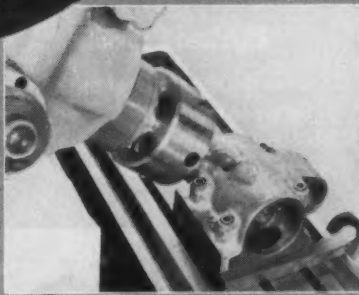
4" Quill Travel; 3 Quill Feeds; .0015, .003, .006; 8 Spindle Speeds; 110 to 3600 RPM; Table Size 40½" x 10"; Cutterhead Spindle Motor 2 HP

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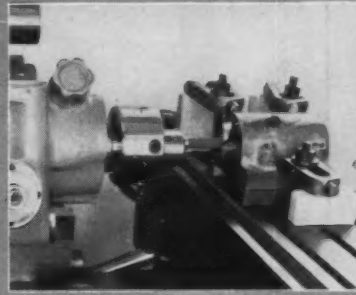
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Angular boring on a cast iron saddle bracket boring a 1" dia. hole. Depth of bore 1¾" removing ⅛" stock on roughing cut. Finish cut removes .010"; Tolerance on I.D. .001".



HORIZONTAL COUNTER BORING

Horizontal counter boring operation of a 3" dia. hole on same saddle bracket. Depth of cut 1" to a shoulder removing approximately ⅛" on rough cut. Finish cut .010"; tolerance on I.D. .001".

COMPANY

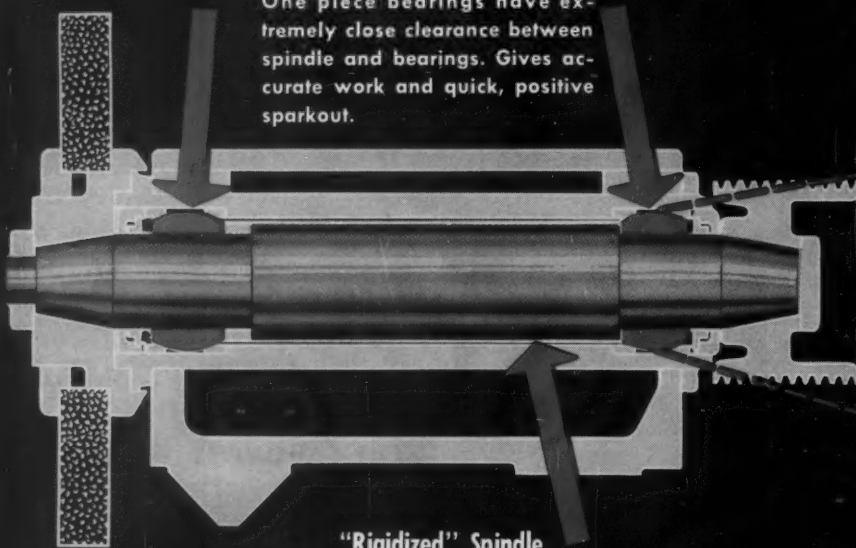
SPRINGFIELD 7,
MASSACHUSETTS

Only Landis grinders have "rigidized" bearings and spindles

- for
- maximum production
 - fine finishes
 - high precision

"Rigidized" Microsphere Bearings

One piece bearings have extremely close clearance between spindle and bearings. Gives accurate work and quick, positive sparkout.



"Rigidized" Spindle

Because the diameter of the spindle between bearings is increased, you can take heavy cuts without loss of accuracy or finish.

LANDIS

precision grinders

LANDIS TOOL COMPANY

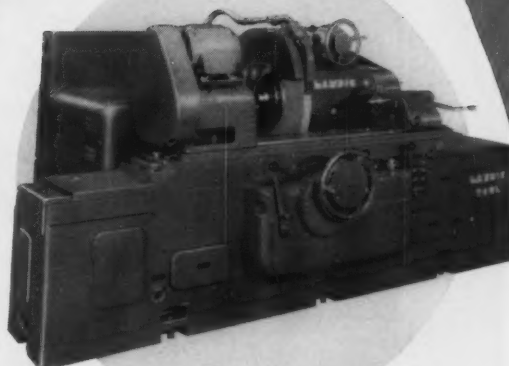
WAYNESBORO, PENNA., U. S. A.



Landis Universal Grinders
have rigidized Microsphere
bearings and spindle.



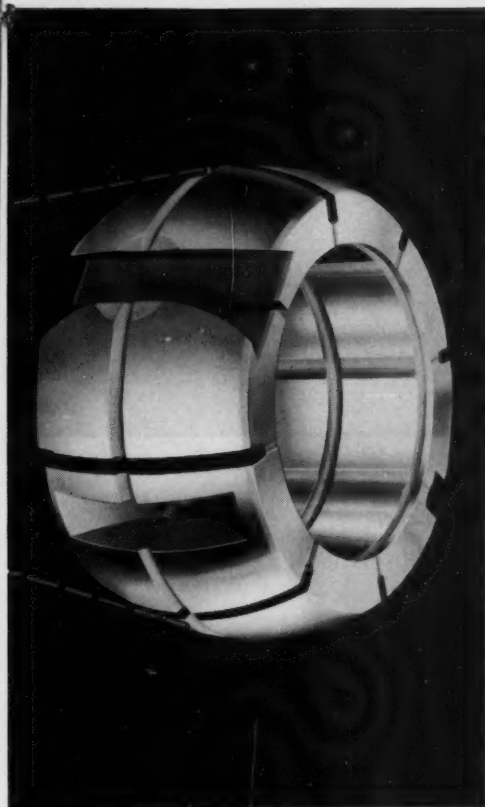
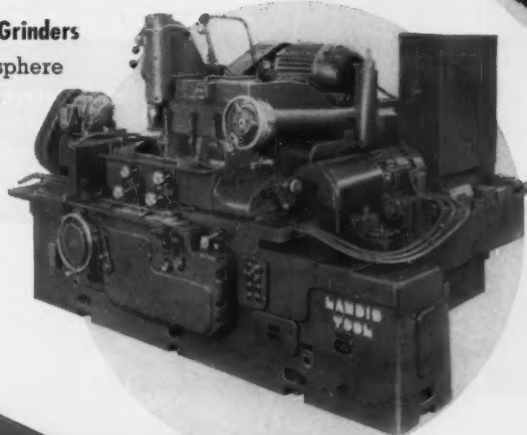
Landis Plain Grinders
have rigidized Micro-
sphere bearings and
spindle.



**Landis Centerless
Grinders** have rigid-
ized Microsphere
bearings and spindle
in both the grinding
wheel and regulating
wheel heads.



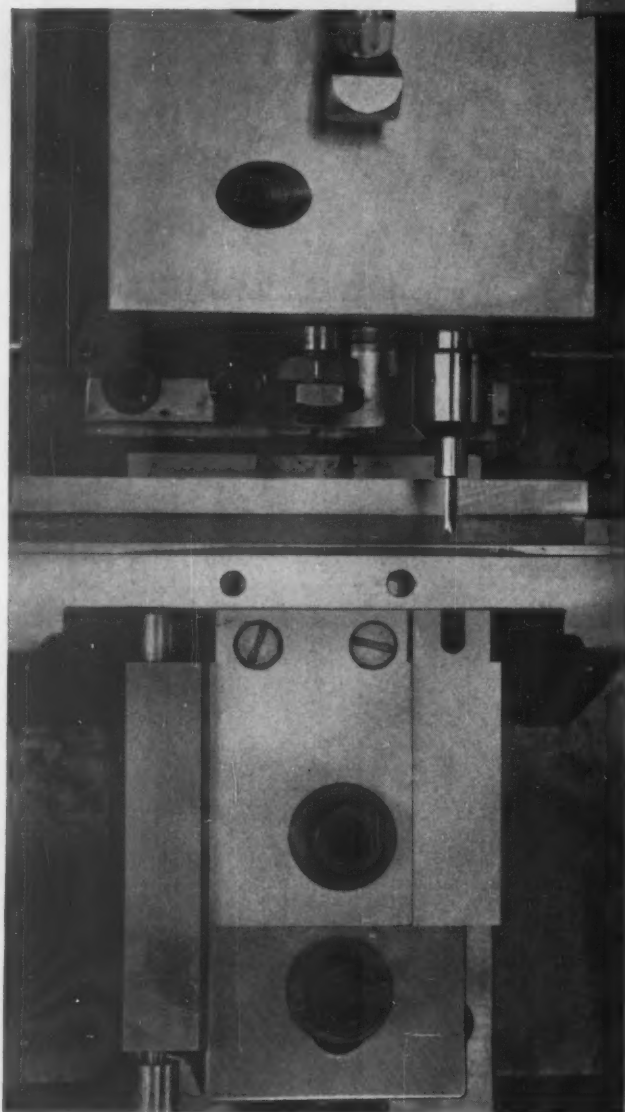
Landis Single-Purpose Grinders
have rigidized Microsphere
bearings and spindle.



Now!

In Addition to Trimming, Piercing,

TAPPING



Allen-Bradley Co. Part E-10128, Coil Terminal produced complete on a No. 33 U. S. Multi-Slide, including tapping a 6-32 hole. Shown three times actual size.

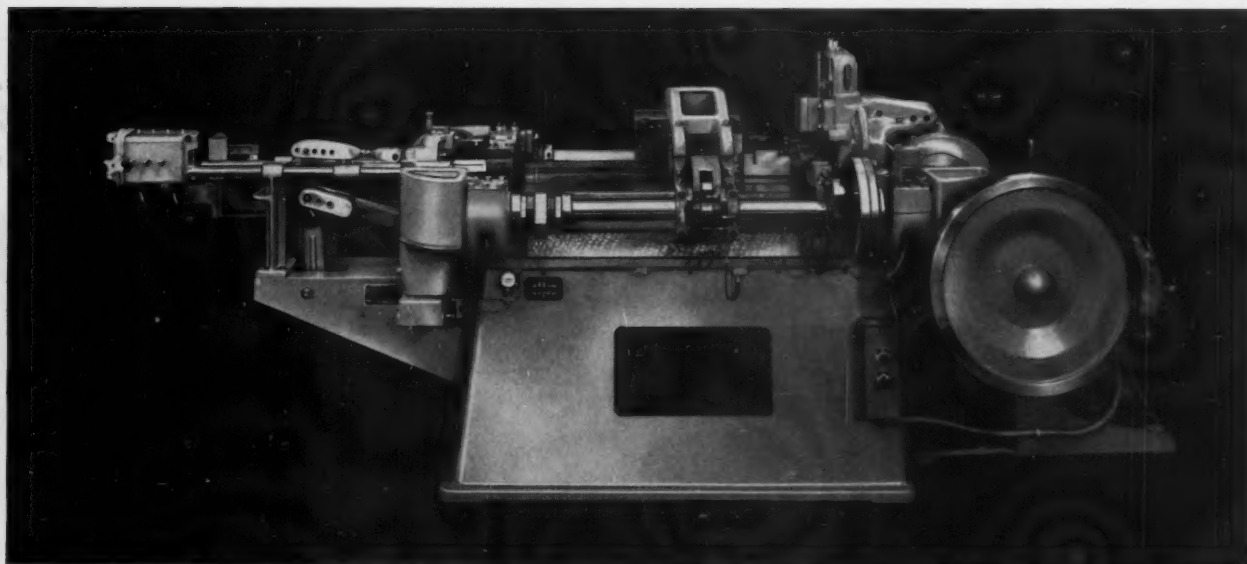
Close up top view looking down into tapping position on the U. S. Multi-Slide.

See this equipment in operation at Booth 215. Machine Tool Show, International Amphitheatre, Chicago, Illinois—September 6-17, 1955.



Swaging, Embossing, Blanking and Forming

ON THE U. S. MULTI-SLIDE!



Standard #33 U. S. Multi-Slide Machine which is used (with the addition of a tapping head) for the production of the Allen Bradley Company part.

The Allen Bradley Company, Milwaukee, Wisconsin, manufacturers of quality motor controls will install in their plant a #33 U. S. Multi-Slide Machine equipped with tapping head to produce a Coil Terminal (shown to the left above) complete including the tapping of a 6-32 hole. The incorporation of the tapping in the Multi-Slide eliminates the need for a secondary operation. The U. S. Multi-Slide is designed and built for the automatic production of stampings, and any or all of the following operations may be incorporated to produce complete parts at each stroke of the machine: trimming, piercing, swaging, embossing, blanking and forming. The possibility of including a tapping operation increases the versatility of the Multi-Slide and offers to the user increased potential for cost reduction by eliminating secondary operations and handlings. U. S. Multi-Slides are available in four sizes. Bulletin #15-M contains complete specifications—ask for a copy.

U.S. TOOL COMPANY, Inc.

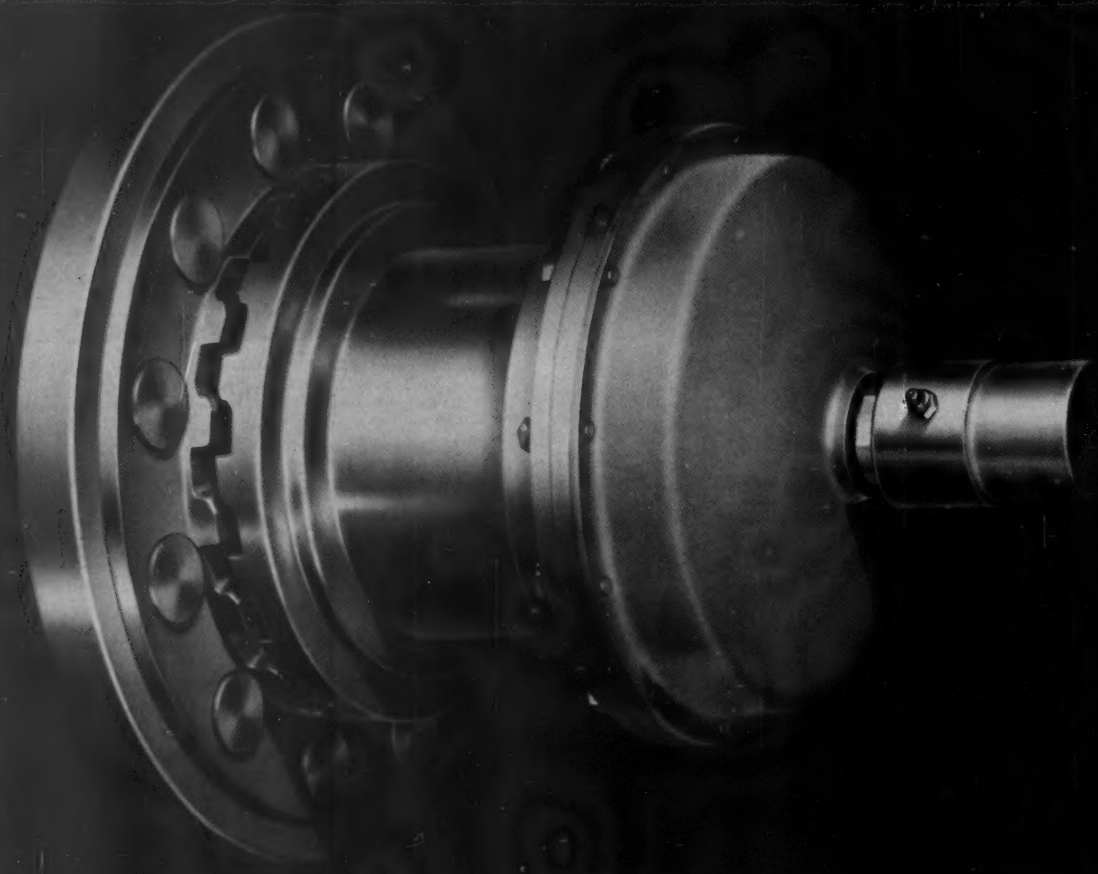
AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers

U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

Exclusive **NIAGARA** **Electro-**

A prime factor in the operating economy



- Examine it. See it operate. Try it yourself. Compare it point for point. The Niagara Electro-Pneumatic Clutch is distinctly superior in every respect: hourly output ... ruggedness ... simplicity ... safety ... savings in operation and maintenance. *It's functionally different in every major detail!*

There, in a nutshell, you have one of the principal reasons why Niagara presses continually out-perform all others. For fact-loaded details, as applied to single or double crank inclinable, gap frame, horn and deep throat presses, request specific literature and consult with a Niagara representative.



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DISTRICT OFFICES:

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Pneumatic Clutch

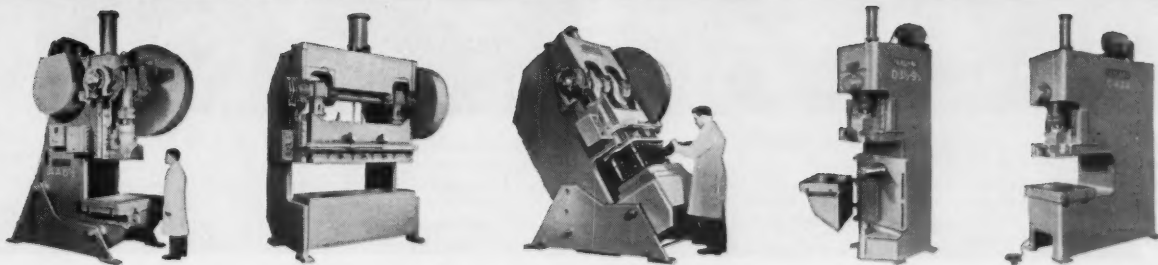
greater output, safety and of Niagara Presses

For Better Performance and Safety

- **ENGAGES AND DISENGAGES INSTANTLY** at any point in the stroke.
- **CAN BE SINGLE-STROKED, JOGGED** (forward and in reverse) or operated continuously.
- **STOPS INSTANTLY** by push button, electric eye, limit switch or similar devices — regardless of crank position.
- **PROVIDES EFFORTLESS PRESS OPERATION** by palm buttons or foot switch.
- **FAILS SAFE.** Press stops automatically if electric current or air pressure fails.

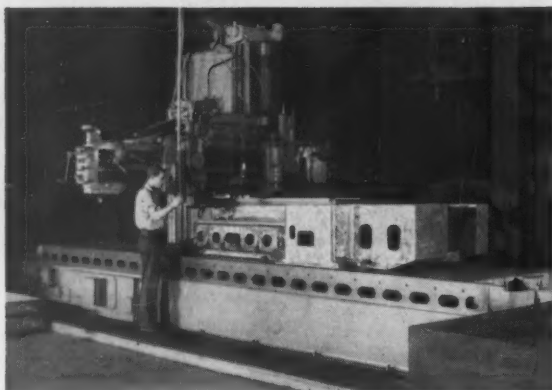
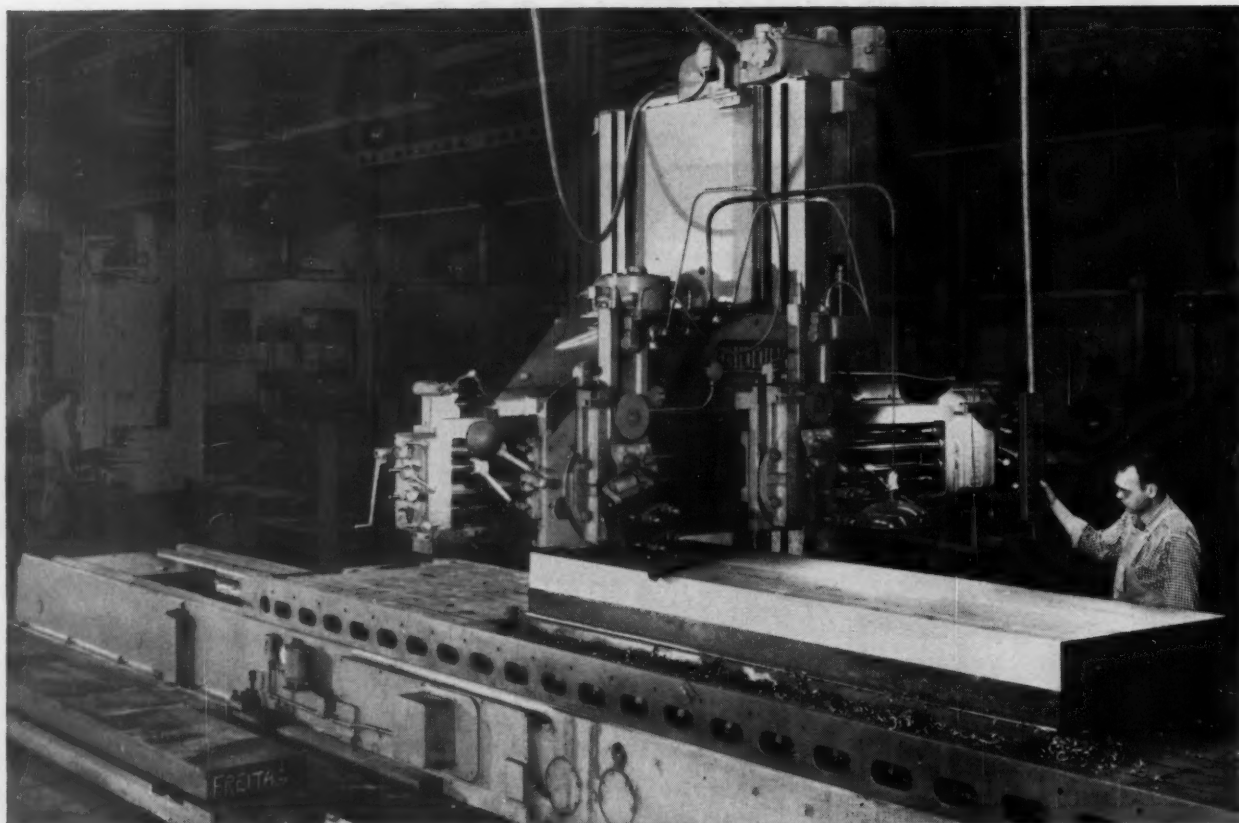
For Less Maintenance

- **NO FRICTION SURFACES** to slip, heat up and wear.
- **SIMPLE, COMPACT DESIGN.** Nothing to adjust.
- **LOW INERTIA.** Small in diameter. Operates directly on crankshaft, the slowest rotating shaft. No gears nor high speed shafts, etc. to start and stop
- **LENGTHENS GEAR LIFE.** Wear is distributed uniformly, because engagement load is not always applied to same teeth.
- **RUNS IN SEALED BATH OF OIL** to minimize wear.
- **EASILY ACCESSIBLE.** Mounted at end of shaft, external to flywheel.
- **NO BUCKING** of clutch vs. brake.

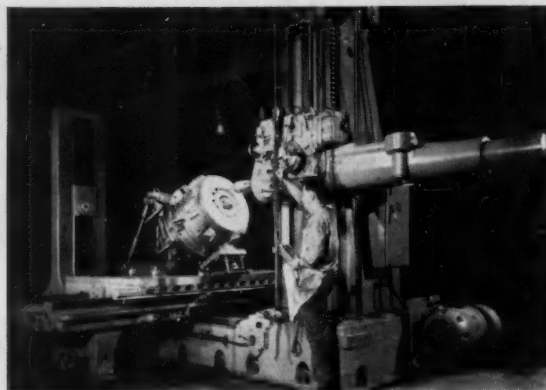


America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

Lower costs... ...higher quality



Here's a typical example of a large workpiece being planed on a Giddings & Lewis 62" x 60" x 24' Openside Planer. The planer's openside construction simplifies setup of unusually large workpiece that requires the full range of the machine. What's more, it holds tolerances within ten-thousandths and provides greater flexibility of operations at high speeds.



This special mold for a die-cast engine part is precision-machined to close tolerances on Giddings & Lewis' Model 350-T Horizontal Boring, Drilling and Milling machine. The 350-T is equipped with extended saddle and saddle supports, also a micrometer measuring device which permits readings to .0001" of vertical travel of headstock and cross travel of machine table on the saddle.

quicker delivery parts

with Giddings & Lewis Hypro Openside Planers and Model 350-T Horizontal Boring, Drilling and Milling Machines
—says report from R. H. Freitag Manufacturing Co.

MANUFACTURING plants everywhere depend on R. H. Freitag Mfg. Co. of Akron, Ohio to produce superior products to exact limits of precision at lower cost. Contributing to this outstanding ability are four Giddings & Lewis precision machines which provide the means to faster cutting, heavier cuts, better finishes and above all greater accuracy.

Extremely versatile, the G&L's are the busiest machines in Freitag's modern machine shop. They produce many intricate parts required in the manufacture of aircraft, automobiles, tools and dies, and components for other major industries.

Two heavy-duty Model 350-T (Table type) Horizontal Boring, Drilling and Milling machines (5" dia. spindles) are equipped with extended saddle and sad-

dle supports. They also feature an Automatic Electric Positioning Device which selects and controls the distances between machined holes. In addition, there are two G&L Hypro Openside Planers—a 48" x 48" x 32' machine and an extra heavy-duty 62" x 60" x 24'.

For more information on how machines like these can help you perform an exceptionally wide variety of operations, see your Giddings & Lewis representative, or write direct to factory.

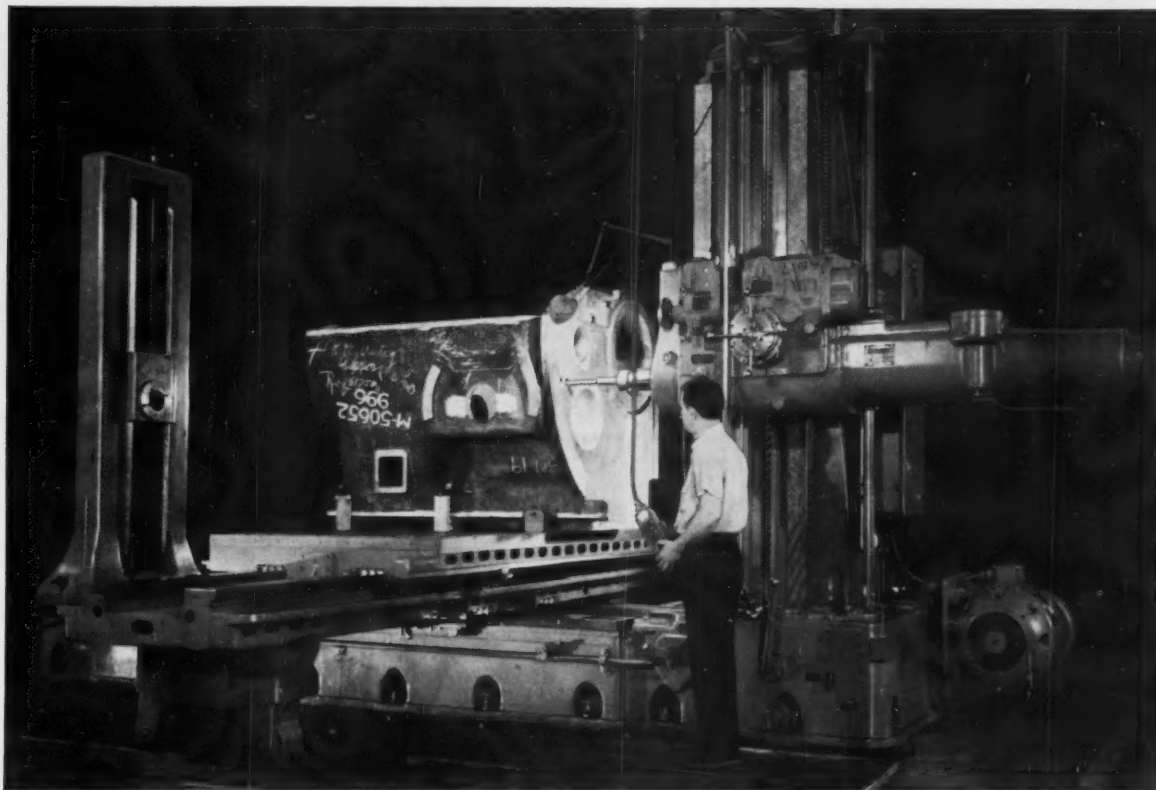


**GIDDINGS & LEWIS
MACHINE TOOL CO.**

FOND DU LAC, WISCONSIN



Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines—table, floor and planer types; Hypro Double Housing and Openside Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting tools.





"Competitive wheels have never equalled G Bond wheels on our jobs." This Massachusetts tool manufacturer further reports he considers G Bond wheels as maximum load production wheels, besides being extremely free cutting, requiring very little dressing and giving very long life. His requirements are precision grinding hard steel to a very high finish, and to parallel tolerances of .0001". The machine is a Norton 10" Hydraulic Surface Grinder.



Better surface grinding for you . . . G BOND users' reports prove it!

*Top speed, new economy among many
"TOUCH of GOLD" advantages listed*

Reports from surface grinding customers on the performance of G Bond wheels sound pretty much alike. That's logical, because each customer is getting exactly the advantages he's looking for — *freer, cooler, faster cutting action . . . heavier cuts without burning . . . closer tolerances and smoother finishes . . . easier dressing and more pieces per dressing . . . more work, and more kinds of work, per wheel.*

Your Own Surface Grinding
will benefit by the G Bond's unique abil-

ity to hold each abrasive grain just long enough for maximum cutting action — an important "Touch of Gold" advantage that means time and money saved, plus better product quality, throughout the range of precision and semi-precision grinding jobs.

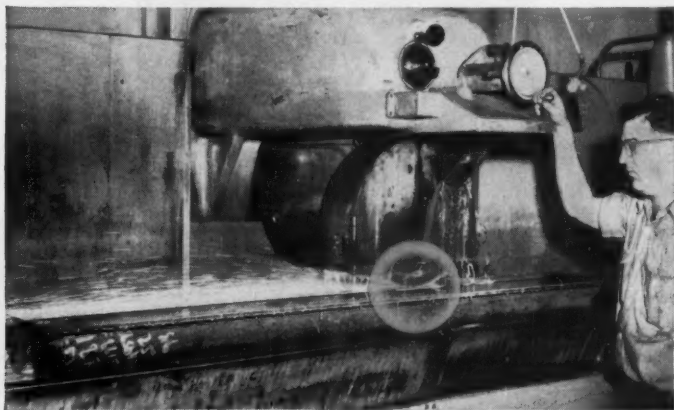
See Your Norton Distributor

for the G Bond wheels, cylinders and segments you need. They're available in a variety of famous Norton abrasives. Of these, 32 ALUNDUM* abrasive is particu-

larly suited for fast stock removal and heavy feeds — it grinds exceptionally cool and fast, with minimum dressing. And remember: only Norton offers you such long experience in both grinding wheels and grinding machines to help you produce more at lower cost. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.



Grinding precision spur gears of SAE 8620 steel, hardened to 59-63 Rockwell C, this Maryland pump and motor builder thoroughly tested G Bond wheels against other makes. He reports that G Bond wheels cut cooler, hold form much better, last 50% longer due to less frequent dressing, and are easier on diamonds.



"Norton G Bond wheels are faster and freer cutting, need less dressing than any other wheels we've used," says this Pennsylvania metal working company. Material ground is boiler plate and miscellaneous steel plate. Stock removal rate is 4.5 to 6 cubic inches per minute.

W-1644



Jigs, fixtures and other parts of miscellaneous steels, besides some of cast iron, are the jobs on which G Bond segments are used by this Ohio tool and gage maker. He credits the G Bond segments with giving a better finish, with less dressing, than any he previously used.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries



*Making better products...
to make your products better*

and its BEHR-MANNING division

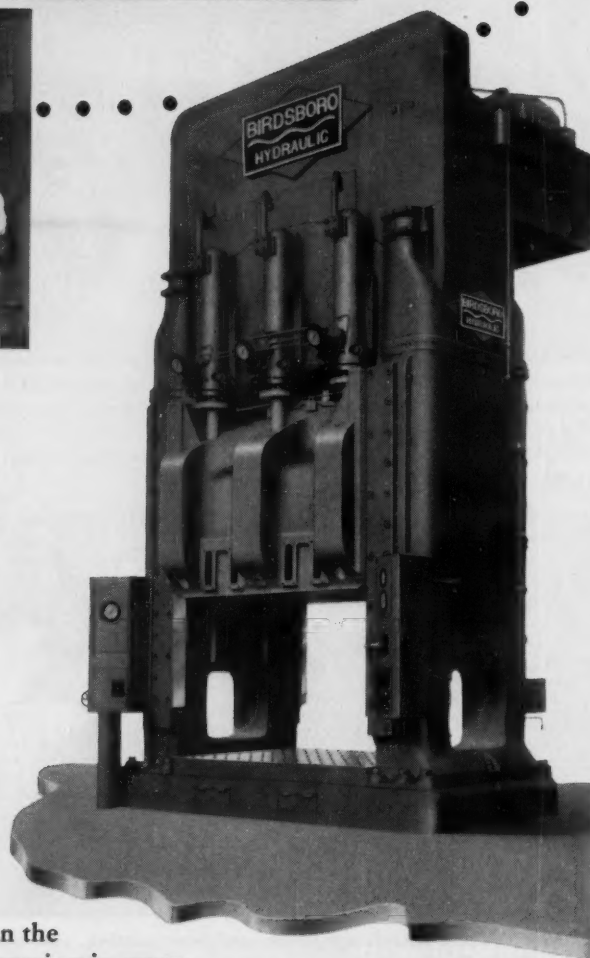
NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

For more information on products advertised, use Inquiry Card, page 245

MACHINERY, August, 1955—19



STEP UP YOUR PRESS PRODUCTION with **BIRDSBORO** HYDRAULIC PRESSES



Designers and Builders of:

STEEL MILL MACHINERY

HYDRAULIC PRESSES

CRUSHING MACHINERY

SPECIAL MACHINERY

STEEL CASTINGS

Weldments "CAST-WELD" Design

ROLLS: Steel, Alloy Iron, Alloy Steel

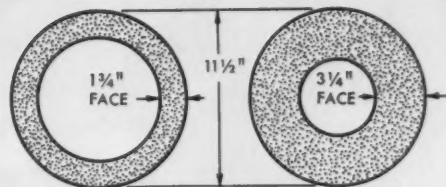
You can rely on the advanced engineering in every BIRDSBORO Hydraulic Press to give you the two qualities you want most in your metalworking presses—high production and low maintenance. Whether the press you need is small or large . . . for turning out one or a variety of different parts or products . . . call in BIRDSBORO engineers as your first step to more profitable press operations.

HP-21-55

BIRDSBORO

BIRDSBORO STEEL FOUNDRY & MACHINE CO., BIRDSBORO, PENNA. Offices in Birdsboro, Pa. and Pittsburgh, Pa.

Production per wheel up 36%



FORMER WHEEL
47,405 PIECES

GARDNER WHEEL
65,050 PIECES

**use of wider face increases production—
cuts abrasive costs.**

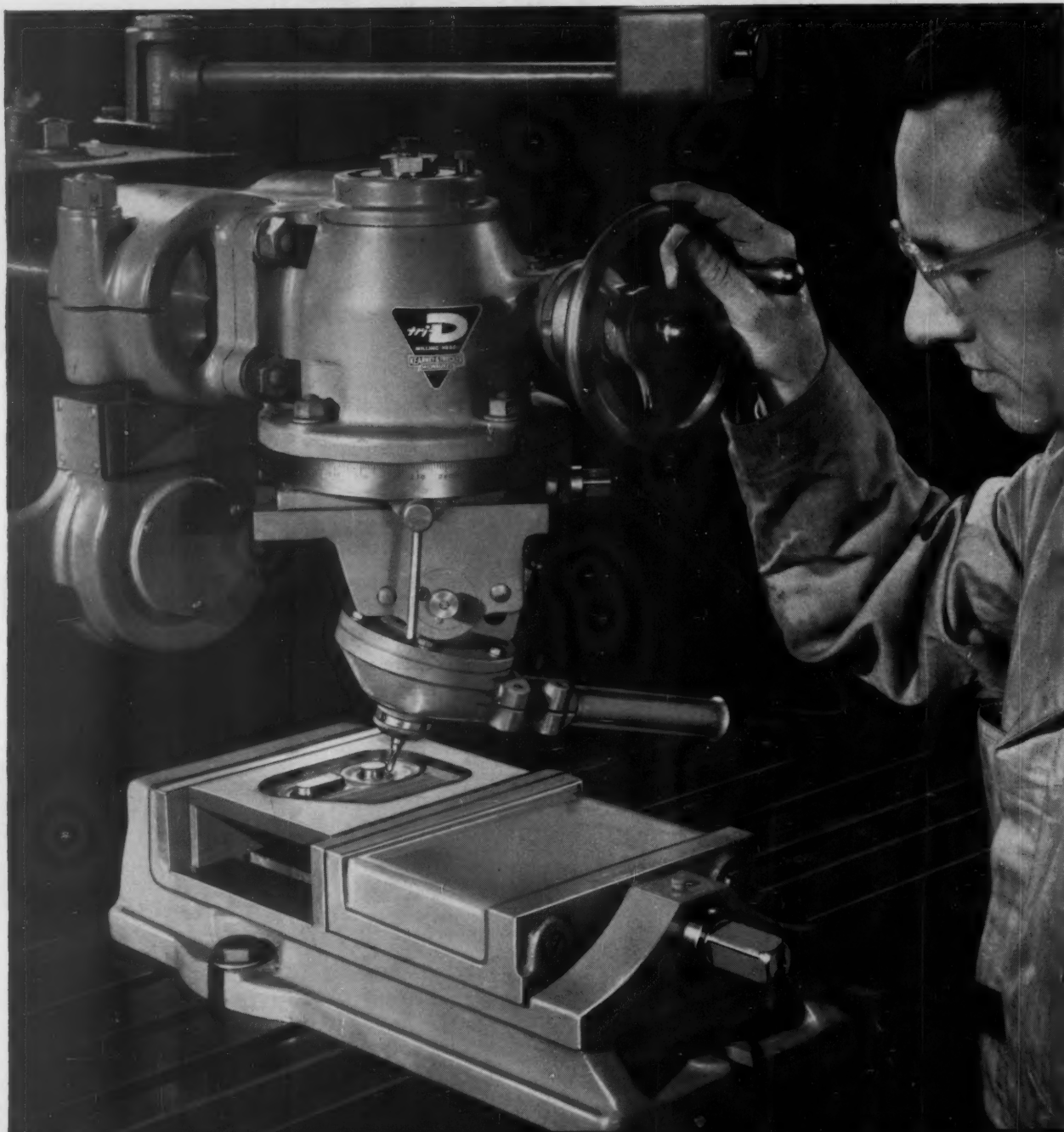
There may be a similar opportunity in your shop to cut abrasive costs. A request gets an analysis of your job.

GARDNER

abrasive discs

BELOIT, WISCONSIN

Mill circles and angles in



Angular adjustment of cutter in the vertical plane is an exclusive feature of the TRI-D Milling Head. Here, operator performs finish milling on intricate workpiece requiring straight, circular, angular and

radii milling . . . all in a single set-up.

This job and many others are featured in a 20-minute sound color film, "The Little Showoff." Write on your company stationery for reservation.

Builders of Precision and Production Machine Tools Since 1898

one set-up with

For tool rooms, die shops or production milling—do it faster, easier with new TRI-D Head

Kearney & Trecker's new TRI-D Milling Head — featuring rotary movement, lateral and angular adjustment in vertical plane — measurably cuts production milling costs . . . eliminates multiple set-ups . . . produces more in less time. As illustrated, the TRI-D attachment is ideally suited for rough and finish milling of various geometric shapes—straight lines, radii, circles, angles — all in a single set-up. What's more, it's adaptable for quick and easy mounting on almost all horizontal and some vertical milling machines . . . *regardless of make.*

Learn what TRI-D can do for you—how different it is from all other types of milling heads. Your Kearney & Trecker representative will be glad to arrange a "proof-positive" demonstration without any obligation. Contact him today, or write Kearney & Trecker Corporation, 6784 W. National Avenue, Milwaukee 14, Wisconsin.



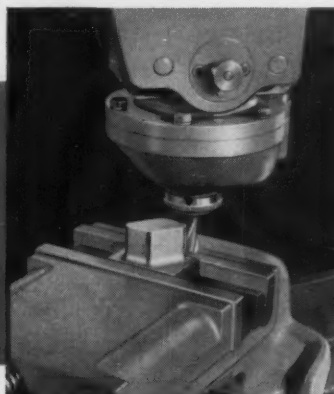
Pat. No. 2286821
Other Pat. Pend.



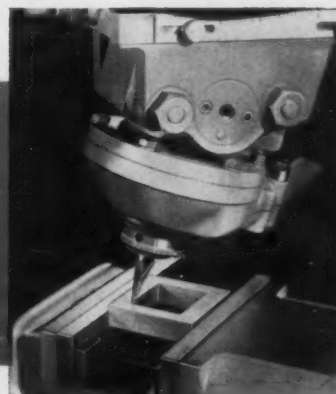
Kearney & Trecker will display, and have in operation, its latest machine tools. More than 25 standard and production machines, including attachments and accessories, will be exhibited. Be sure to visit Booth No. 508.



Die (left) and punch (right) are rough and finish milled in a single set-up, using all three basic movements of the TRI-D and universal milling machine. Table is swiveled for milling straight side of both workpieces. Table movement is



used to mill the long straight side. TRI-D is rotated. Saddle feed is engaged to mill short straight side. At tangent of next radii, saddle feed is disengaged and entire procedure repeated. Clearance angle in die is milled using same dimensions.



TRI-D Head, with an ordinary end-mill ground to a specific angle, is used to finish a "square corner." Adjustment of TRI-D Head and swivel block to prescribed setting and vertical feed of the milling machine is required to do the job.

Kearney & Trecker
CORPORATION
MILWAUKEE 14, WISCONSIN

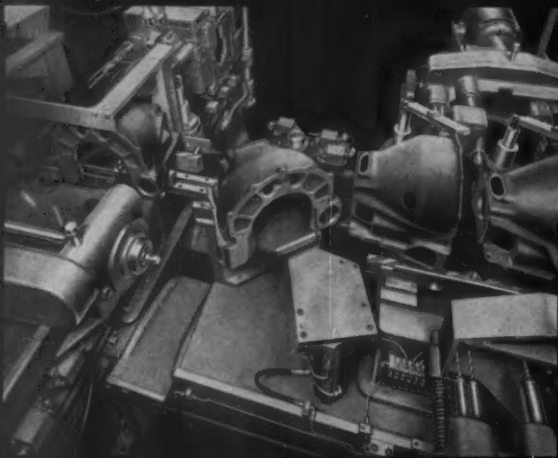


KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

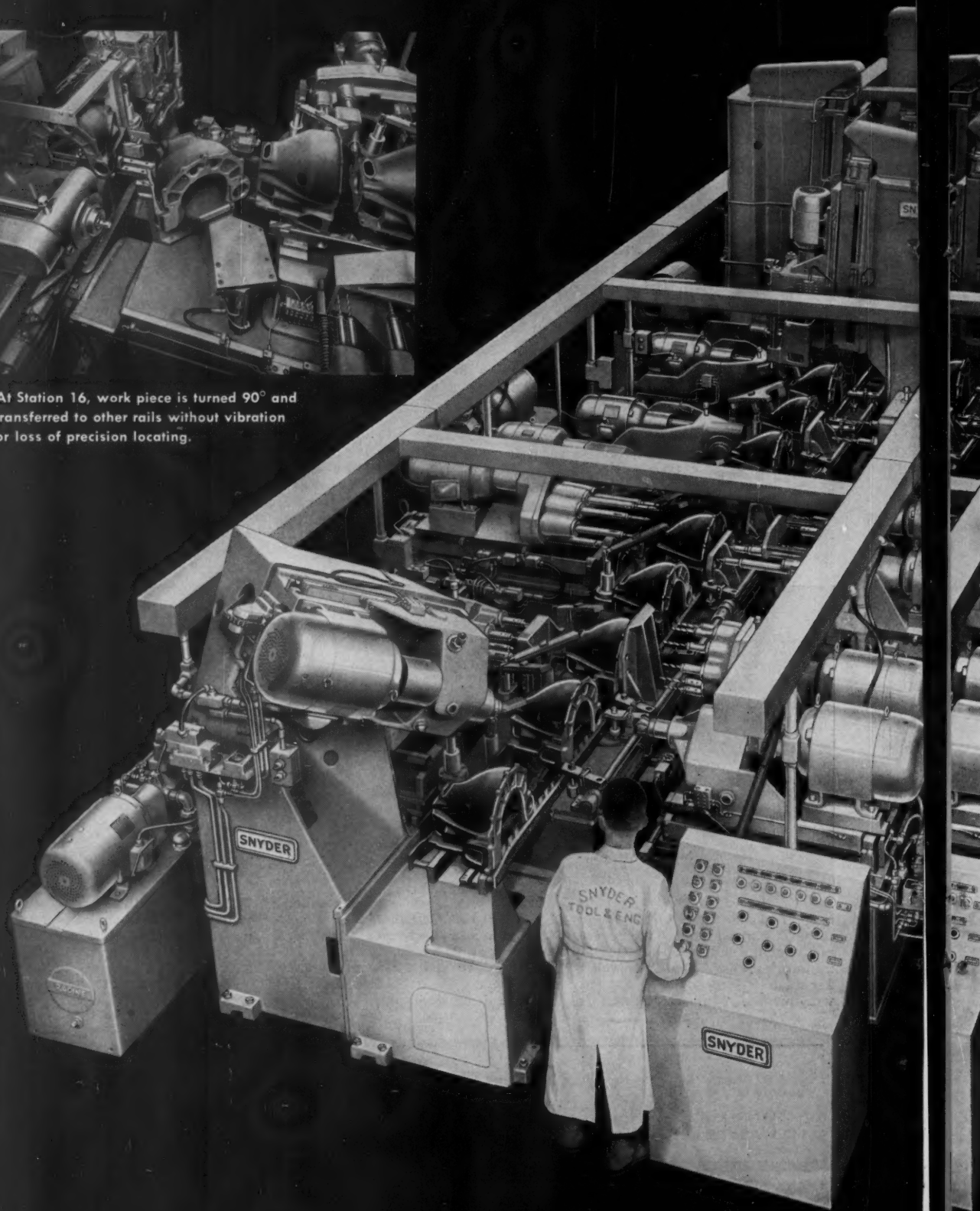


For more information on Kearney & Trecker's new TRI-D Milling Head, write for catalog No. TD-10.

SNYDER-AUTOMATION



At Station 16, work piece is turned 90° and transferred to other rails without vibration or loss of precision locating.



LEADER FOR 30 YEARS

Presents

SNYDER SPECIAL

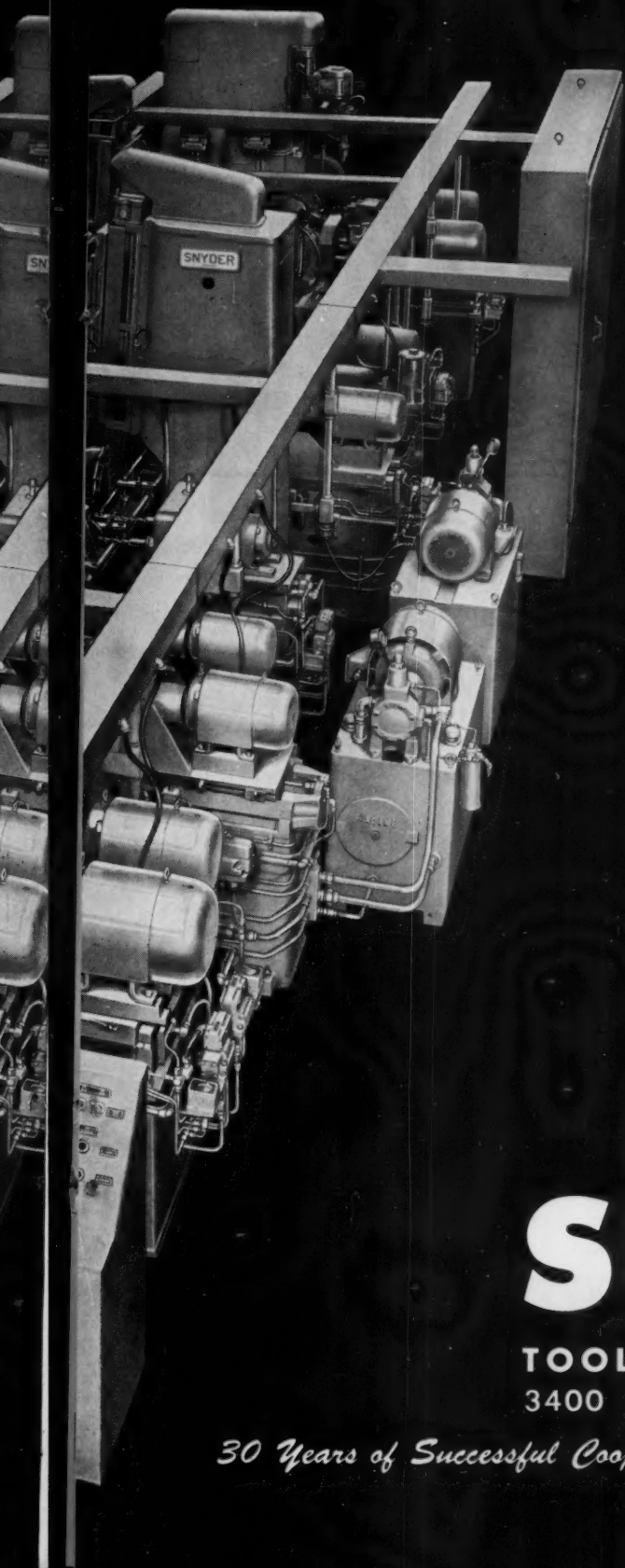
22-STATION automatic transfer machine for processing cast iron clutch housings, which drills, rough and finish bores, mills, saws, taps, spot-faces, counterbores and chamfers, performing a total of 110 operations on various surfaces or holes of various dimensions. Production, 124 cycles an hour at 80% efficiency.

UNUSUAL FEATURES: At Station 1, a 2" breather hole is trepanned from solid metal and finish bored with one tool. At Stations 8 and 9, a section of transfer rails cam-linked to milling units, drops to bring work piece into line with cutters. At Station 16, work piece is turned 90° and transferred to other rails without vibration or loss of precision locating.

SNYDER

TOOL & ENGINEERING COMPANY
3400 E. LAFAYETTE, DETROIT 7, MICHIGAN

30 Years of Successful Cooperation with Leading American Industries



**A
FASTER**

more economical

**MACHINE
OPERATION**

■ Footburt Surface Broaching may be the answer to your problem of faster machining. Many jobs that were slow and expensive when handled by conventional machining methods are now being produced by Surface Broaching. Production in most cases is as fast as the speed at which parts can be loaded. Yet cutting speeds are so low that the cost of tool maintenance shows great savings. Exceptional finish can be maintained. We will gladly discuss your machining problems with you.

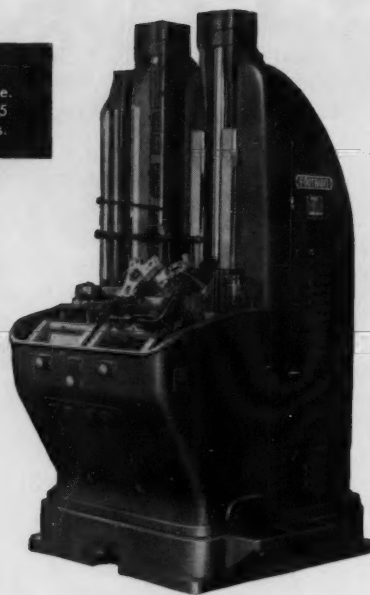
THE FOOTE-BURT COMPANY

Cleveland 8, Ohio

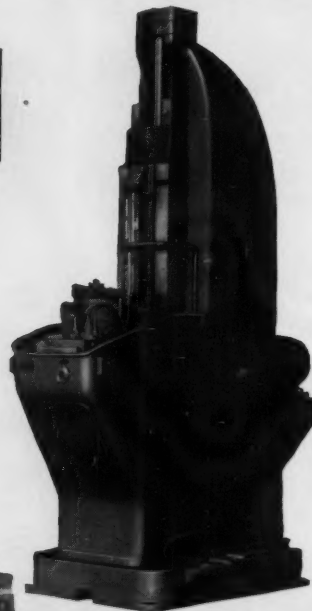
Detroit Office: General Motors Building



Duplex Surface
Broaching Machine.
Made in 5, 10, 15
and 25 Ton Sizes.



Single Slide Surface
Broaching Machine.
Made in 5, 10, 15
and 25 Ton Sizes.



Continuous Type
Broaching Machine.
Made in 5 Sizes.

FOOTBURT
PIONEERS IN SURFACE BROACHING



How to keep jobs cool every day of the year...

...**SWITCH TO CIMCOOL**®, the radically new and different cutting fluid that cools so fast tools and chips actually stay cool to the touch. And here are two more reasons why CIMCOOL Concentrate has become, in just a few short years, the largest selling chemical cutting fluid in the world:

■ **CIMCOOL LOWERS COSTS** because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.

■ **CIMCOOL DOES A BETTER JOB** because of its chemical lubricity. It permits faster speeds and increases tool life, for it combines friction reduction and cooling capacity in a degree never before attained.

We'll be happy to supply information on the many specific advantages of CIMCOOL Concentrate—or details on the entire family of CIMCOOL Cutting Fluids. Just contact us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Wire, write, or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

CIMCOOL Concentrate—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMCOOL Tapping Compound—Permits the use of highest tapping speeds and increases tap life amazingly.

CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT Base Additive—For jobs requiring an oil-base cutting fluid. Added to mineral oils, it gives an economical mix for higher speeds and feeds.

CIMCOOL Bactericide—The most effective agent yet developed to overcome rancidity.

CIMCOOL Machine Cleaner—The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

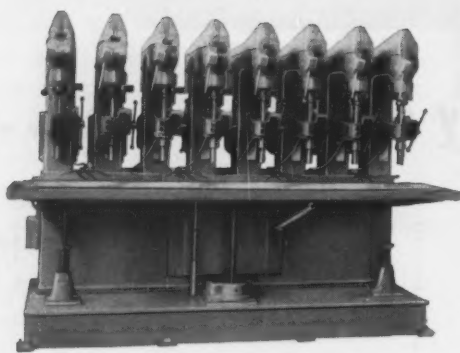
CIMCOOL

Cutting Fluids

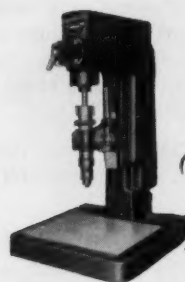
100%
for ~~85%~~ of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

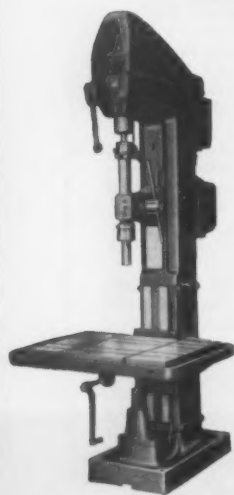
Avey has the right one



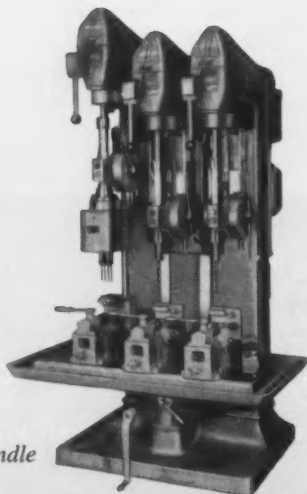
(7) Super 8 spindle



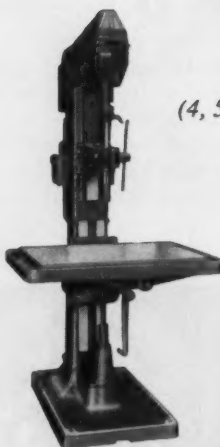
(1) Bench type



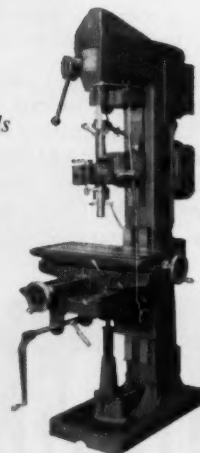
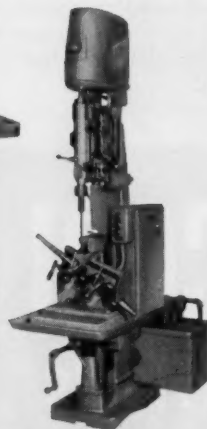
(2) Column type



(3) Multi-spindle



(4, 5, 6) Tool room drills



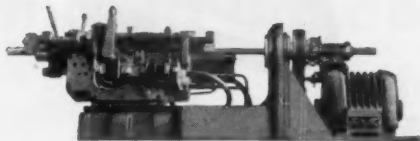
Whatever your light and medium duty drilling needs, it's a sure bet that the machine you need is made by Avey. The whole Avey line would pack this magazine with pictures —would give you every combination of size, capacity, speed, overhang, and table arrangement to fit your requirements. The ones shown will give you the general idea. Write for literature.

(Figures 1 through 6) *Standard Drilling and Tapping Machines*. Capacities in cast iron from very small numbered drills to 1½"; 6 or 8 speeds up to 12,000 rpm; No. 32 Jacobs chuck to No. 4 Morse taper; 4 feeds; 1 to 6 spindles; column or bench type; wide range of swing. Featuring such "bonus" advances as micrometer stop collar; telescoping spindle guard; dynamically balanced rotating parts; rack and pinion operated motor plate; large tool and die shop tables; and Avey's pace-setting spindle construction.

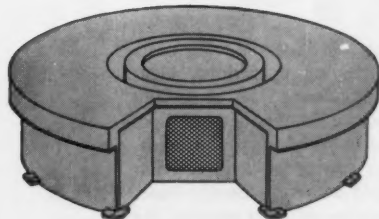
(4, 5, and 6) *Avey tool room drills*, built in No. 2 and No. 3 BMA-6 sizes. Large table 34" x 25"; round table 18" diameter; compound table 25" x 12".

(7) *Super 8 Spindle Drilling and Tapping Machine*. No. 2 Morse taper. Power lift to table by push button control. Hand feed, power feed, lead screw tapping. Four feeds, 6 speeds. Built-in coolant system.

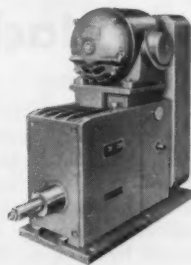
for Avey makes them all



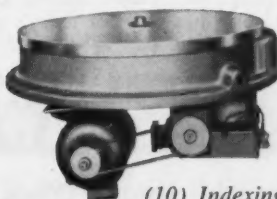
(9) Avey-draulic



(11) Standard base



(8) Cam feed unit



(10) Indexing table

(8) *Automatic Cam Feed Units*. For drilling, tapping, reaming, hollow milling. Vee belt or gear drive. Nos. 1, 2, and 3 Morse taper. Capacity in cast iron: No. 1, ½"; No. 2, 1". Mount at any angle. Fully or semi-automatic. Self-contained, tamper-proof.

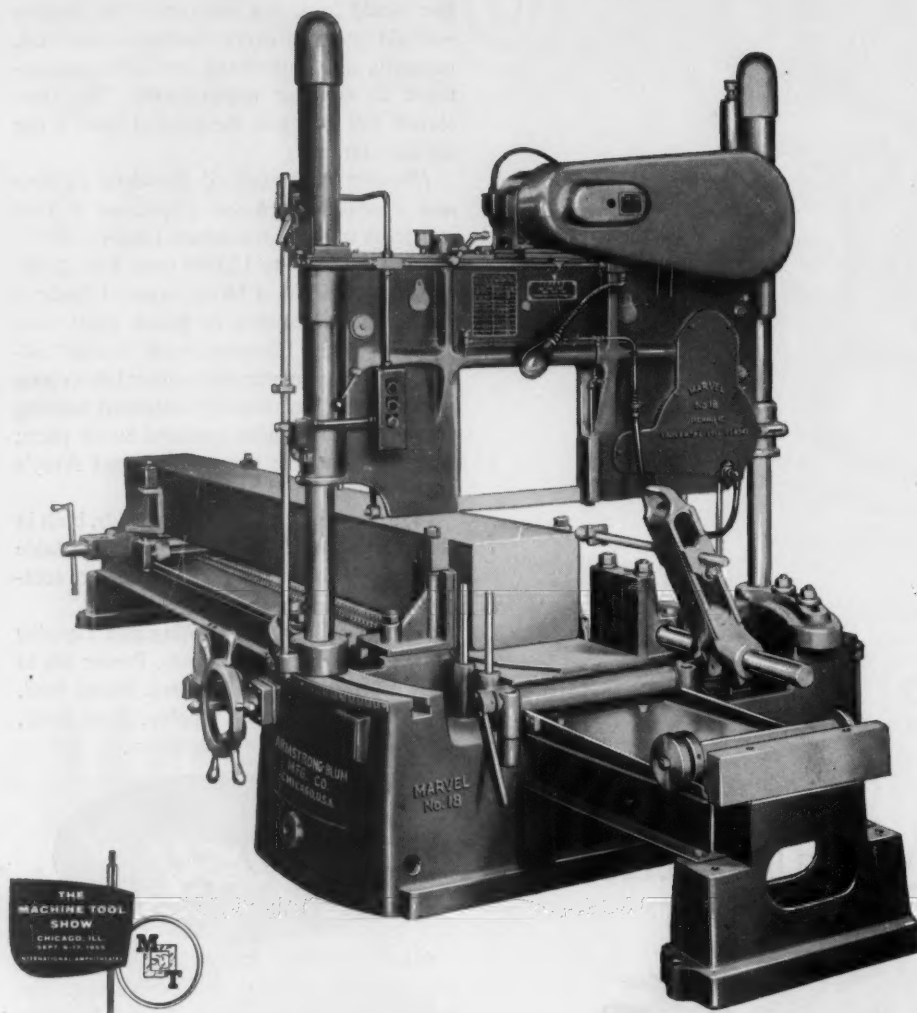
(9) *Avey-draulic feed unit*. Automatic withdrawal for chip removal only when necessary during deep hole drilling. Rapid advance, feed, and rapid return. Jump feed attachment available. Standard strokes 12" up to 30". Avey's patented Torque-matic control optional.

(10) *Automatic index tables*. Rapid, accurate indexing to .001". Even or uneven index patterns obtainable. 16" to 48" diameter. All adaptable to Avey standard bases.

(11) *Steel Bases*. One of Avey's standard line of fabricated bases. Stress relieved, sand-blasted, machined, and painted to fit your application. Combine 8, 9, 10, and 11, and you get fast returns on your investment, and a step ahead of your competition!

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines



No Job too big or too tough... for MARVEL "Giant" Hack Saws

These giant MARVEL Hydraulic Hack Saws (No. 18, Capacity 18" x 18"; and No. 24, Capacity 24" x 24") were *basically* designed for rapid and economical cut-off of BIG WORK. They are not merely "conventional" designs "stretched" to big capacity. They are truly designed and built with the ruggedness and rigidity necessary to withstand the rough treatment of sawing big work, even though the work is in the "toughest of the tough" alloys.

They are reliably fulfilling the cut-off requirements in innumerable steel mills, forge shops, structural shops, warehouses, and machine shops, with assured low tool cost and minimum kerf loss of steel.

In addition to cutting-off, they are reducing costs by eliminating further machining operations. Heat treated die blocks are being reclaimed for re-sinking by sawing off the worn face; columns, beams, pipe, and tubing are being sawed to *finished*, square ends, eliminating milling; angular sawing is done conveniently by swinging the upper structure on the base, to any angle up to 45 degrees—*without moving the work*.

Contemplating the modern trend toward ever tougher steels and larger sizes, these are the logical sawing machines to buy, not only for today's needs but for tomorrow's as well.

Write for
Catalog



ARMSTRONG-BLUM MFG. CO. 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.



JUST AS A NEGATIVE guarantees you an exact duplication of a photograph each and every time, you are always assured a

A manufacturing achievement
that will save you money and
increase your production...



POSITIVE DUPLICATION of an original grinding wheel every time through the CINCINNATI (PD) Manufacturing Process.

NOW! Cincinnati Grinding Wheels

offer



POSITIVE DUPLICATION

It's the greatest grinding wheel development in years! For through the CINCINNATI (PD) Manufacturing Process you are assured a Positive Duplication of the original wheel every time you reorder.

"On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike. Yet they are priced no higher than ordinary wheels.

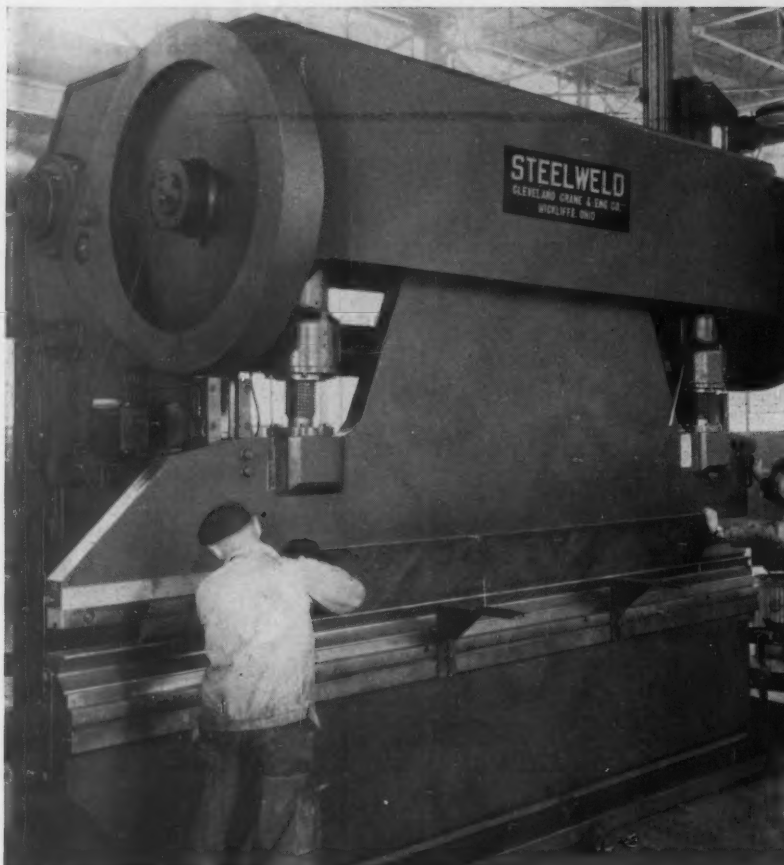
Let us prove to you how CINCINNATI (PD) WHEELS can save you money and increase your production. Just contact us and we'll send one of our representatives—

men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.



THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio

Accurate Records Prove LOW COST OPERATION



These forms enable the Chicago Plant to develop records which provide concrete facts on repairs and maintenance for all machines.

A Steelweld Model J4 1/2-10 press working on various size steel plates up to 16'-0" x 1/4". The ease with which the hand-cranked back gauge is adjusted is a favorable feature. The press is easily jogged in minute amounts. Shown is a 14'-0" x 1/4" plate being formed for a hopper.

Link-Belt manufactures a wide variety of conveying and processing equipment such as apron, screw, oscillating and overhead chain trolley conveyors, railroad car dumpers, bucket elevators and other handling equipment.

SOME YEARS AGO the Pershing Road Plant of Link-Belt Company, Chicago, established a record system for keeping track of repairs and maintenance costs of all machine tools. This system provides a detailed history of maintenance required and lists every item of expense for every machine.

The record system proves that the maintenance

cost for Steelweld machines, both bending presses and shears, is comparatively low.

Because of this, and the fact that Steelweld machines have many desirable operational features, a number of which are unavailable elsewhere, Link-Belt regards them highly. In fact, so much that 20 Steelweld Presses and Shears are now serving Link-Belt plants in nine cities.



GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

5459 EAST 281 STREET, WICKLIFFE, OHIO

STEELWELD BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

Curtain going up...

...on the **WORLD'S BEST INVESTMENT** in action

CLASS OF SERVICE

This is a full-rate Telegram or Cablegram unless its deferred character is indicated by a suitable symbol above or preceding the address.

WESTERN UNION

W. P. MARSHALL, PRESIDENT

FX-1201

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LT=Int'l Letter Telegram
VLT=Int'l Victory Ltr.

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THERE WILL BE PLENTY OF ACTION AND EXCITEMENT AT NATIONAL ACME'S EXHIBITS DURING THE MACHINE TOOL SHOW. STOP IN. SEE THE WORLD'S MOST COMPLETE LINE OF BAR AND CHUCKING AUTOMATICS (BOTH MULTIPLES AND SINGLE SPINDLES) ESTABLISHING THE STANDARDS OF COMPARISON FOR FUTURE MACHINING PRODUCTION.

THE NATIONAL ACME COMPANY

BOOTH
705



also check in at

BOOTH
324

for equipment to reduce threading costs and for electrical components to assure dependable automatic control

See how time is saved on **ACME-GRIDLEYS** ... at the Machine Tool Show

BOOTH

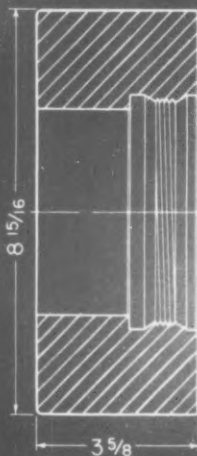
705

SEPTEMBER 6 THROUGH 17

See in action 8 of the world's most versatile and productive multiple and single spindle automatics tooled up on parts such as you are now making or may make tomorrow. These Acme-Gridleys are tooled with carbides, high speed, or a combination of both — depending on the individual job analysis. Compare these speeds with your present methods. If you are not now using Acme-Gridleys, we think you'll get a new conception of metal turning production.



12-inch, Single Spindle ACME-GRIDLEY
Chuck Type Fully Automatic Turret Lathe



FINGER HOLDER — First Operation

MATERIAL—1020 Steel Forging

MACHINE TIME—3 minutes

NO. OF OPERATIONS—11, including tapping 5"-16 with circular chaser collapsing tap. Carbide tooling on all operations except tapping.

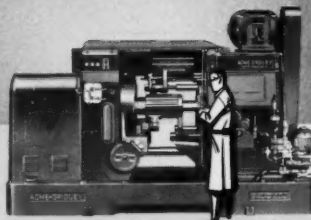
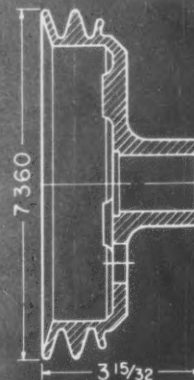
NOTE—Second operation on a Chuck-Matic (See below).

CYLINDRICAL IRON PULLEY

Machine arranged with double indexing to perform 1st and 2nd operations simultaneously in one setup.

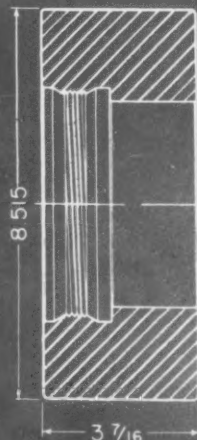
MACHINE TIME—49 seconds

NO. OF OPERATIONS—26; 13 on each end, using carbide tooling all the way



8-inch, 8-Spindle
ACME-GRIDLEY
Chucking Automatic

12-inch, Single Spindle
ACME-GRIDLEY Chucker
(CHUCK-MATIC)



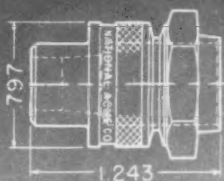
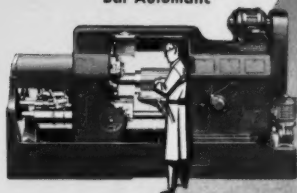
FINGER HOLDER — Second Operation

MATERIAL—1020 Steel Forging

MACHINE TIME—1 minute, 40 seconds

NO. OF OPERATIONS—5, using carbide tooling throughout.

1 1/4-inch, 8-Spindle
ACME-GRIDLEY
Bar Automatic



SPARK PLUG SHELL

MATERIAL—Steel—Open Hearth, Grade A
Leaded.

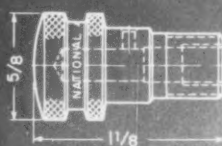
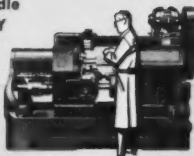
MACHINE TIME—4.5 seconds; gross production,
800 pieces per hour

NO. OF OPERATIONS—16, using a combination
of carbide and high-speed steel tools as best
suits each operation.

3/4-inch, 6-Spindle
ACME-GRIDLEY
Hydraulic Chucking
Automatic



1-inch, 6-Spindle
ACME-GRIDLEY
Bar Automatic



RETAINING SCREW

MATERIAL—Commercial Brass

MACHINE TIME—1.78 seconds; gross pro-
duction, 2000 pieces per hour

NO. OF OPERATIONS—11, including tap-
ping, threading and spindle stopped for
cross drilling.

HOUSING CAP

MATERIAL—Bronze Casting

MACHINE TIME—8 seconds

NO. OF OPERATIONS—11, with
combination of carbide and high
speed steel tooling, as determined
by job analysis.



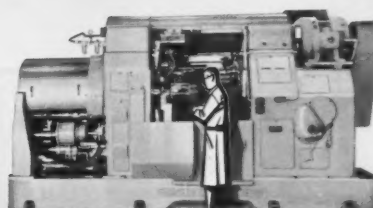
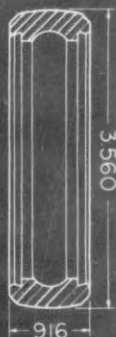
BEARING RACE

Two pieces produced simultaneously

MATERIAL—52100 Steel Tubing

MACHINE TIME—21 seconds (two
pieces); gross production 340 pieces
per hour.

NO. OF OPERATIONS—12; 6 on each
piece, with carbide tooling throughout.



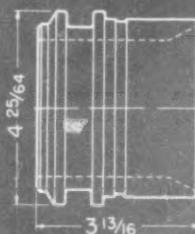
4-inch, 8-Spindle
ACME-GRIDLEY Bar Automatic

FINGER HOLDER SPOOL

MATERIAL—4620 Steel Tubing

MACHINE TIME—3 minutes; gross
production, 20 pieces per hour

NO. OF OPERATIONS—15, includ-
ing angular turning attachment.
Carbide tooling



4 3/4-inch, Single Spindle ACME-GRIDLEY
Bar Type Fully Automatic Turret Lathe



THE NATIONAL ACME COMPANY CLEVELAND 8, OHIO

Remember — You can't do today's job with yesterday's tools — and have a profitable tomorrow

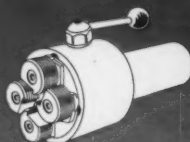
for equipment that will **REDUCE THREADING COSTS . . .**
or for electrical components to assure
DEPENDABLE AUTOMATIC CONTROL



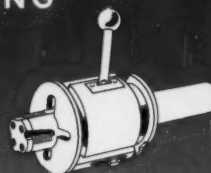
*take a close look at
National Acme exhibits in*

BOOTH
324

THREAD CUTTING



National Acme **VERS-O-TOOLS** —
Threading and Hollow Milling Heads.
(Revolving and Non-Revolving Types)

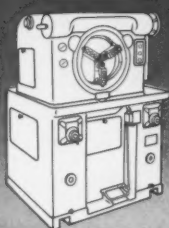


National Acme **COLLAPSING TAPS** —
with Ground Thread Circular and Blade-
Type Chasers

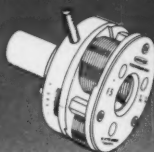
From the
THREADING DIVISION

BASIC TOOLS FOR LOWEST-COST THREADING

THREAD ROLLING



National Acme
**THREAD ROLLING
MACHINE**

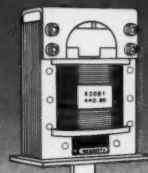


National Acme **"FETTE"**
SELF-OPENING THREAD ROLLING HEAD

From the **ELECTRICAL
MANUFACTURING
DIVISION**



National Acme
LIMIT SWITCHES —
SNAP-LOCK Heavy Duty Type (Illustrated). Also
available in Super-sensitive (Light Contact) Type



National Acme **SOLENOIDS**
Push and Pull Type—AC or DC

BASIC COMPONENTS FOR AUTOMATIC CONTROL



National Acme **MOTOR
STARTER SWITCHES**



National Acme **PUSH BUTTON
CONTROL STATION SWITCHES**

THE NATIONAL ACME COMPANY

170 East 131st Street • Cleveland 8, Ohio

Litho in U.S.A.

Spot, Plug, and Tack-Weld

with the new **SIGMA SPOT-WELDING** process



- * Joins metals up to 1/4-in. thick
- * Adds filler metal automatically
- * Welds from one side of the joint
- * Shields weld area with inert argon gas
- * Operates on Constant Potential power supply

Spot, plug, and tack-weld with one torch. With sigma spot-welding you can make strong spot welds quickly on lapping metal sheets up to 1/8-in. thick, plug and tack-welds on metals up to 1/4-in. thick—and you need access to only one side of the weld joint. Use it on carbon, galvanized, or stainless steel, and copper-base alloys.


It's easy to use. Position the "muzzle" of the water-cooled torch and squeeze the trigger—the machine does the rest. A consumable wire electrode is fed into the weld area as filler metal. Inert argon gas protects

the weld from the air. You can make up to 10 welds a minute, with a completely automatic welding cycle.

Constant Potential adds to efficiency. Sigma spot-welding equipment operates on constant potential power supply to give you the benefit of simplified controls, sure starting, and precise arc voltage. Weld-cratering and wire-sticking are eliminated. Welds are smooth and consistently uniform.

Your local LINDE representative will be pleased to give you booklet F-8778 and more detailed information on the sigma spot-welding process.

Linde Air Products Company A Division of Union Carbide and Carbon Corporation

30 East 42nd Street  New York 17, N. Y.
Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto
(formerly Dominion Oxygen Company)



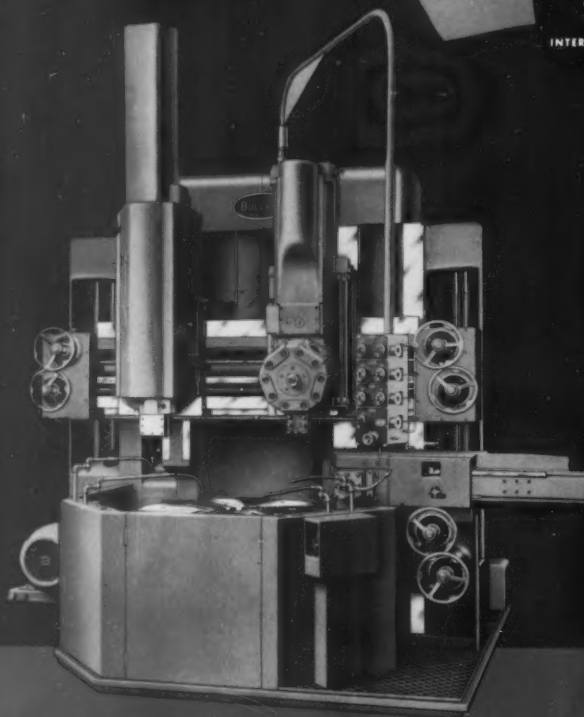
.....you're Invited to.....

BOOTH 1213

THE
MACHINE TOOL
SHOW

CHICAGO, ILL.
SEPT. 6-17, 1955

INTERNATIONAL AMPHITHEATRE

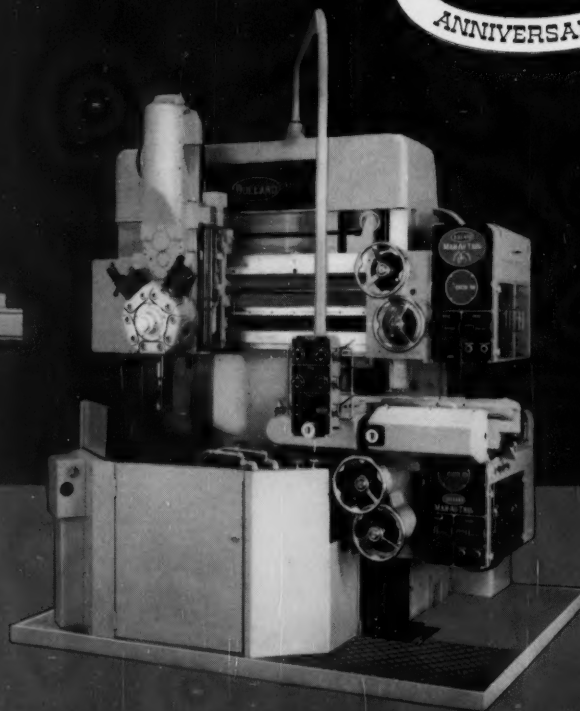


CUT MASTER V.T.L., Model 75

In six sizes, 26" to 76"

table diameters in 10" increments.

Various combinations of heads are available.

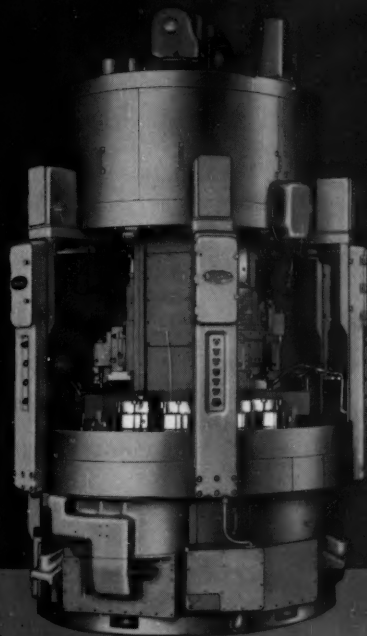


MAN-AU-TROL, Model 75

For fully automatic operation—may be applied to
any or all heads of Cut Master V.T.L. Model 75 at
time of ordering or in your plant at a later date.

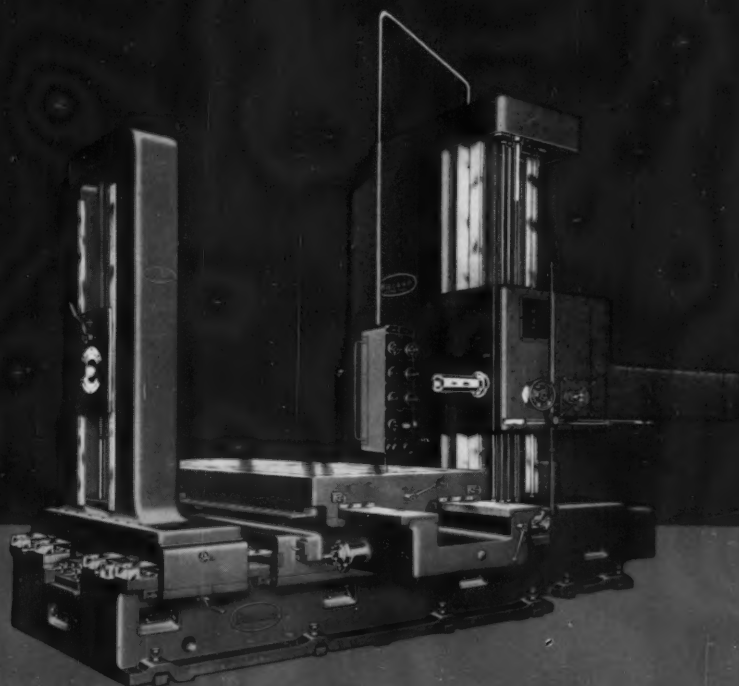
You will see the Most Modern Line
of Machine Tools available to the
... Metal Working Industries ...

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT



MULT-AU-MATIC TYPE "L"

10" with 6, 8, 12 or
16 spindles, 14" and 18" with
6 or 8 spindles. Automatic loader.



**HORIZONTAL BORING, MILLING
AND DRILLING MACHINE Model 75**

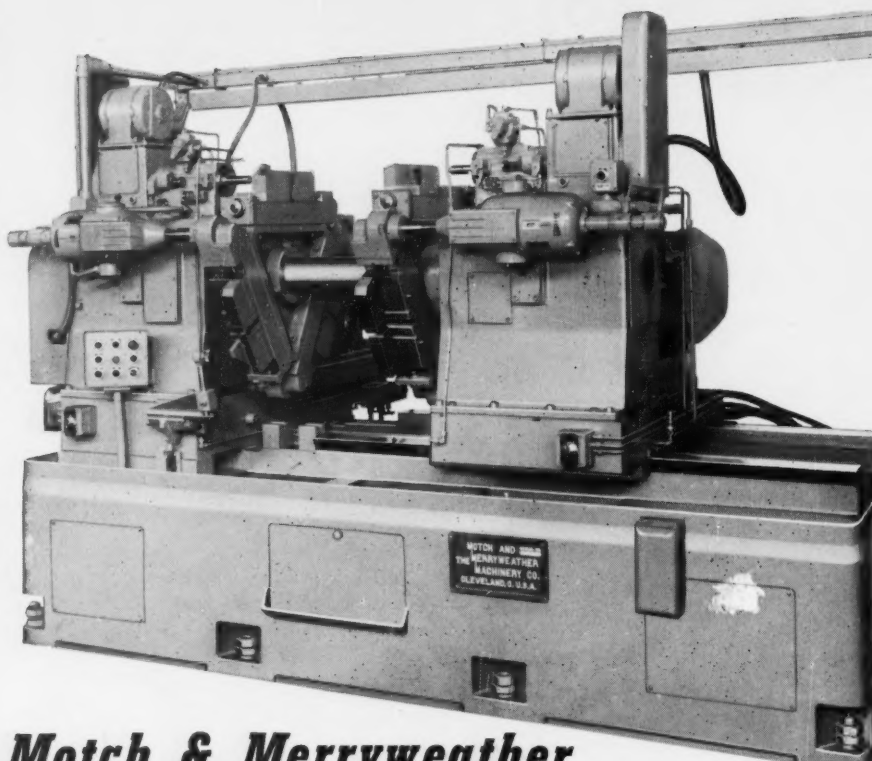
3" 4" and 5" spindle — Available in
many combinations of bed lengths, vertical
capacity and table size. Automatic positioning.

Heavy Duty

Rigid

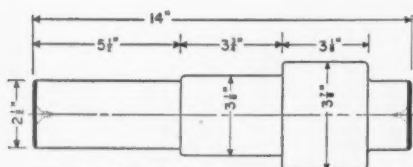
Accurate

Productive



The Motch & Merryweather No. 3-MCT Milling and Centering Machine FOR UNIVERSAL PRODUCTION

Adopt this Active Asset to Automation



Part: Pinion shaft.

Operation: Mill and center drill both ends.

Production: 220 pieces per hour.

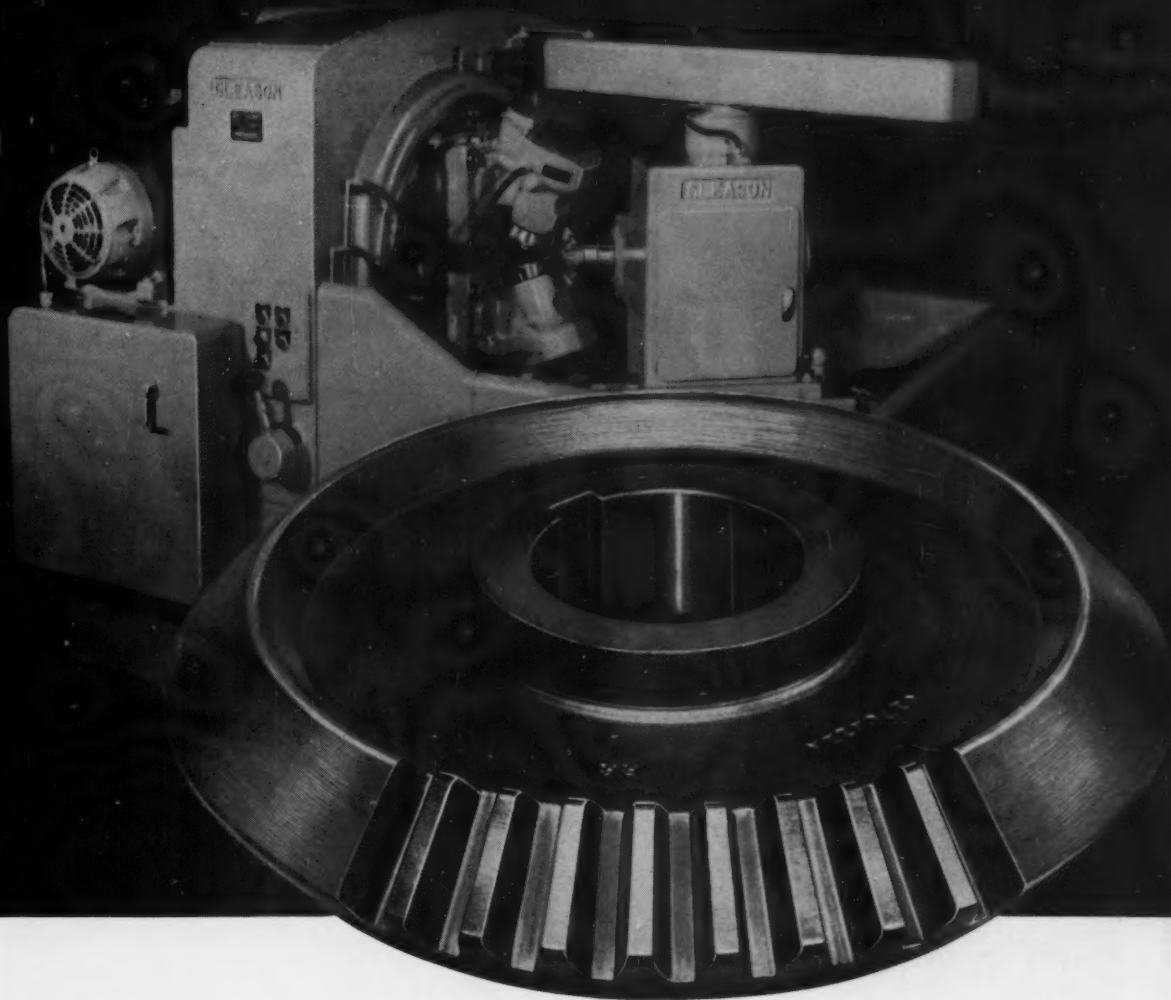
Mass production, yet with extreme accuracy, — that is the central requirement for preparing parts which go to your automatic equipment. Begin automation *right* by preparing your parts *right* on the Motch & Merryweather 3-MCT Milling and Centering Machine. This universal heavy duty unit excels for high single-purpose production, while quick set-up makes short runs profitable. Automatic loading and unloading may be incorporated to handle extremely high production. The 3-MCT performs with a dispatch and precision hitherto unknown.



THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION
CLEVELAND 13, OHIO

Builders also of Production Milling, Vertical Turning, Automatic and Special Machines



A complete gear for a fifth of a gear!

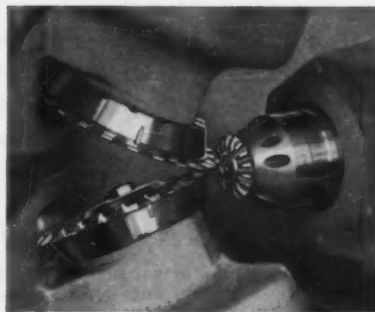
It all depends on the gear, of course. But, by the time an earlier model generator has cut one-fifth of a gear, the new No. 104 Straight Bevel Coniflex* Generator has *completed* a similar gear!

You can increase your production by as much as 400% with this new Gleason machine. You can get these results because this generator has two interlocking disc-type cutters with twenty-four blades each. These cutters

complete a gear in *one rapid operation!*

But that is not all. The No. 104 is easy to set up—it has a wide range of capacity—it is excellent for small quantities or volume production. And, a new generating method insures high efficiency, fine finish, and maximum cutter life.

Write us and we will be pleased to send you a bulletin and further information on the new No. 104 Straight Bevel Coniflex Generator.



The No. 104 Straight Bevel Coniflex Generator completes gears up to $8\frac{1}{2}$ " diameter and $1\frac{3}{8}$ " face width, and from 20 to 3 DP.

*Coniflex® straight bevel gears with localized tooth bearing.



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Builders of bevel gear machinery for over 90 years

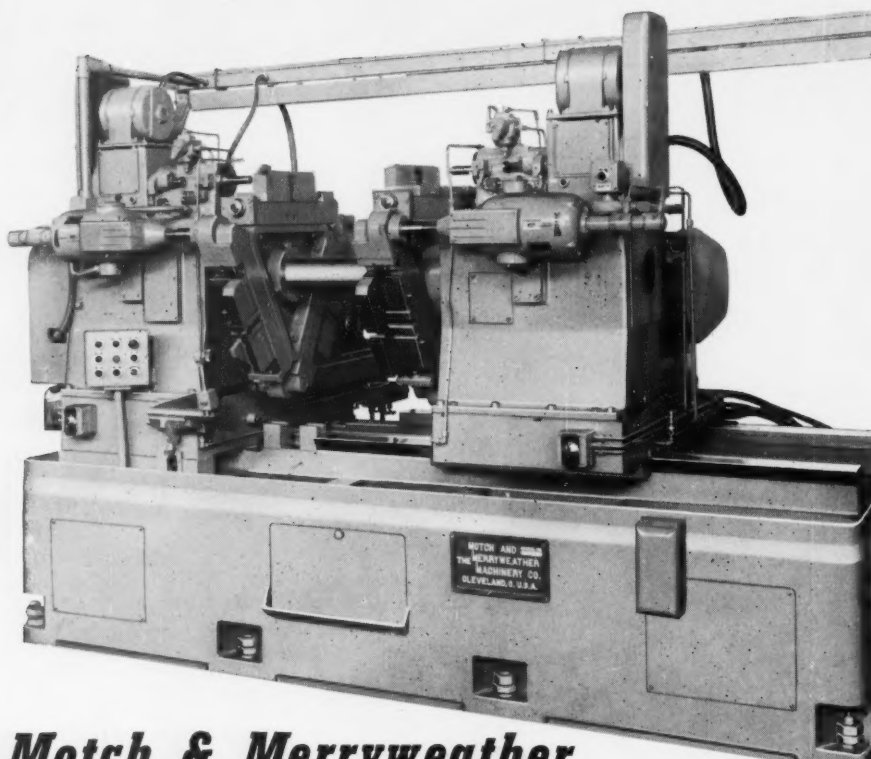
1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

Heavy Duty

Rigid

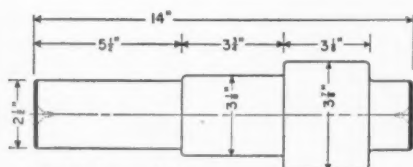
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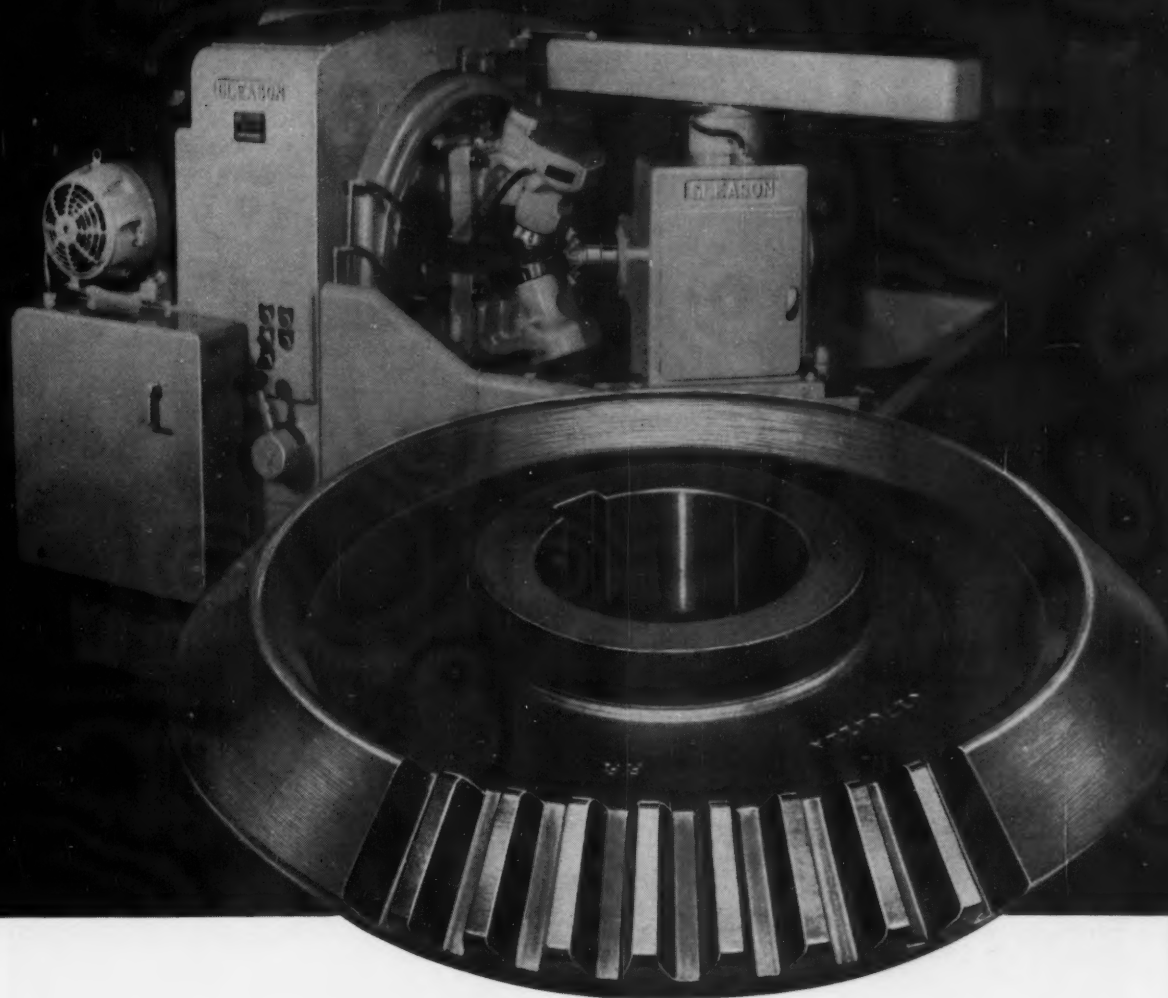
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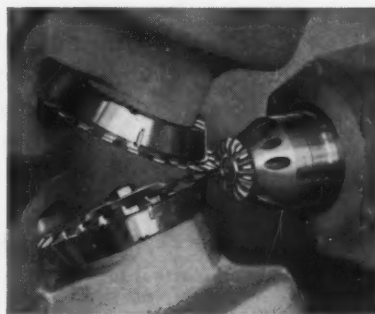
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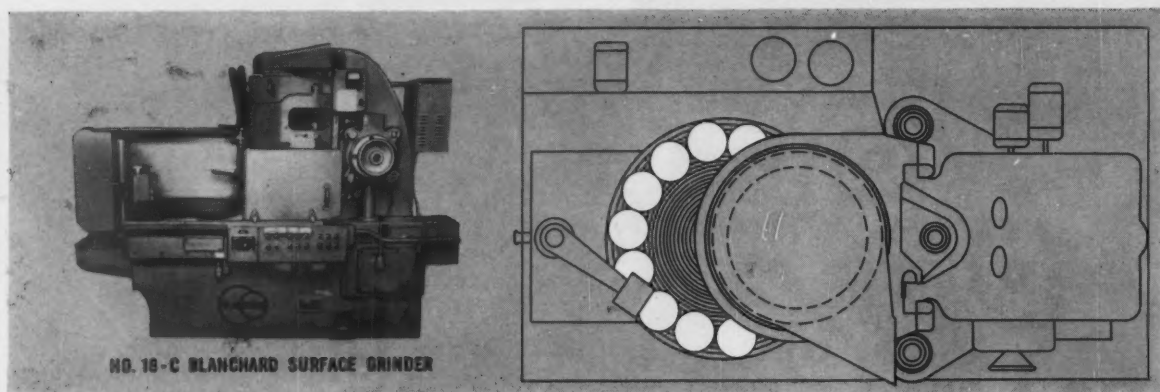
*Coniflex® straight bevel gears with localized tooth bearing.



GLEASON WORKS

Builders of bevel gear machinery for over 90 years

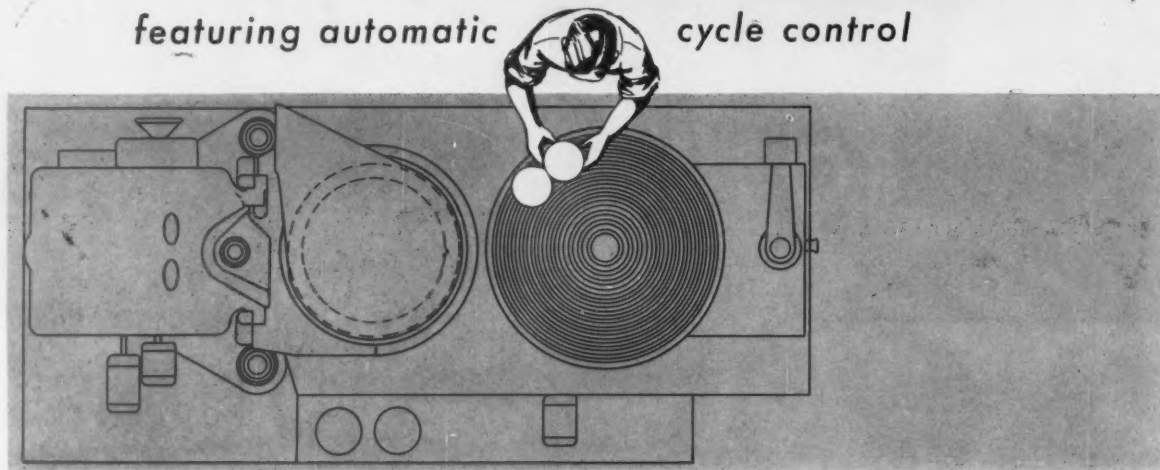
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NO. 18-C BLANCHARD SURFACE GRINDER

Plan for more profitable production with this new Blanchard Grinder

featuring automatic cycle control



This great new Blanchard has the speed and simplicity which guarantee economical grinding on a wide variety of jobs.

One operator can easily operate two of these automatic cycling surface grinders. By using the automatic cycle, he can unload, clean and reload one grinder while the other grinds automatically.

The automatic cycle does everything else: moves chuck (30" or 36" dia.) to grinding position and starts it rotating; starts wheel rotation

and coolant pump; provides rapid wheel approach to work; engages power down-feed at preset rate; changes to fine feed just before finished size is reached; stops feed when work is to size — "sparks" out; raises wheel head; stops wheel, coolant pump and chuck; moves chuck to loading position—demagnetizes chuck.

The No. 18-C also features: push button selection of manual or automatic operation; automatic size control; simple feed and head traverse controls; adjustable dwell timer.

This new Blanchard offers you many new production advantages. Look into them today — write for free catalog showing work done on the No. 18-C.

PUT IT ON THE **BLANCHARD**

THE BLANCHARD MACHINE COMPANY

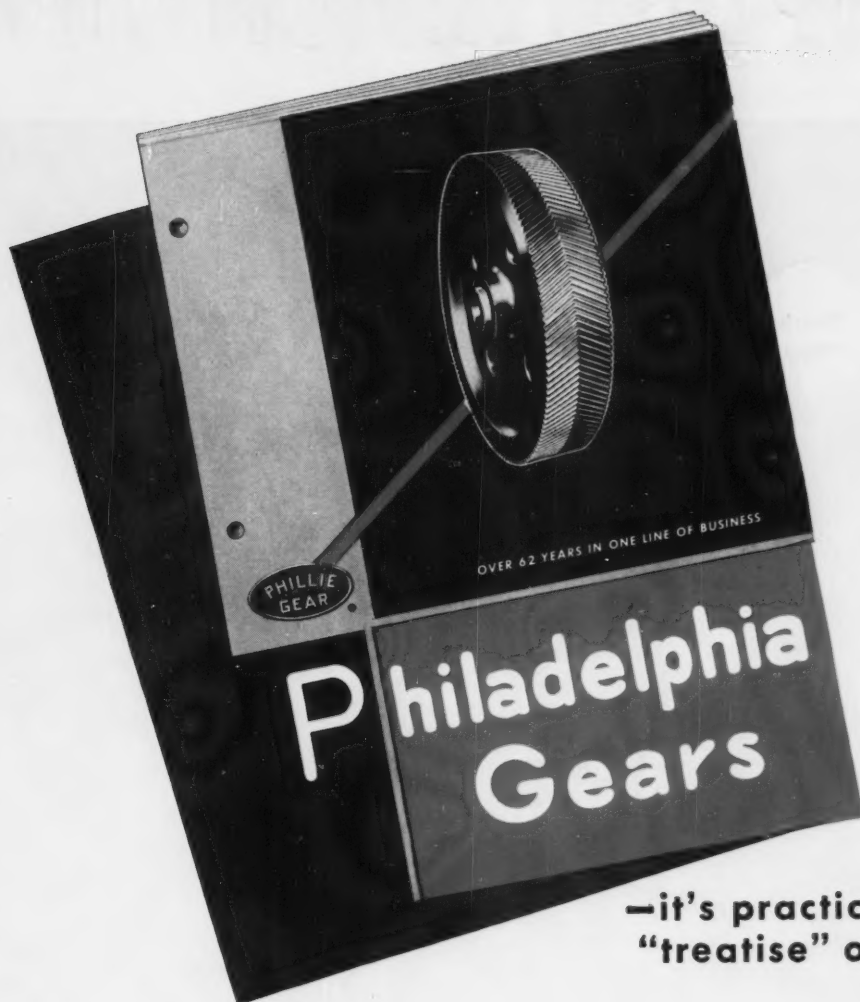
38—MACHINERY, August, 1955

**SEE THE 18-C AT
THE MACHINE TOOL SHOW
CHICAGO, ILL., BOOTH 406**

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

For more information on products advertised, use inquiry Card, page 245

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Please send me a copy of your NEW 76 page GEAR BOOK.

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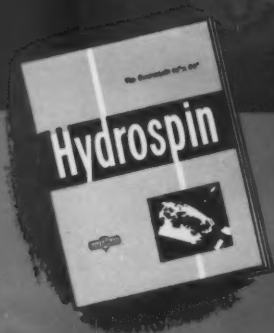
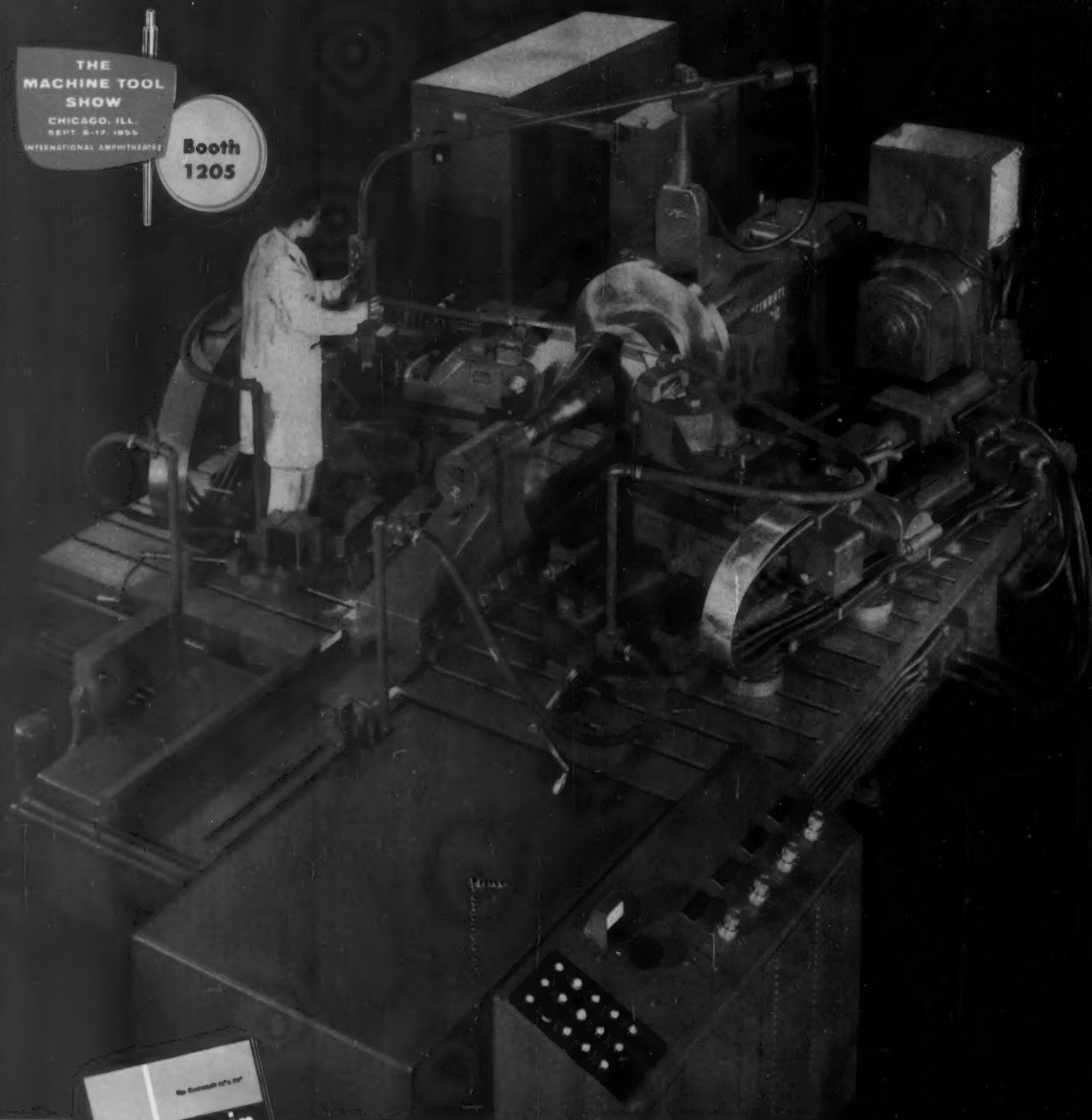
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“CHIPLESS MACHINING” by

THE
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SHOW
CHICAGO, ILL.
SEPT. 8-17, 1955
INTERNATIONAL AMPHITHEATRE

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Write for the
new Hydrospin
Bulletin No.
M-1673-1.

CINCINNATI 42" x 50" HYDROSPIN — Full bed design. Parts up to 42" OD and 50' long can be produced. Also available in 42" x 50" Half Bed design (one roller slide assembly). Hydraulic contour tracing attachment, turning and mandrel grinding attachments and carriers for end mounted rollers also available.

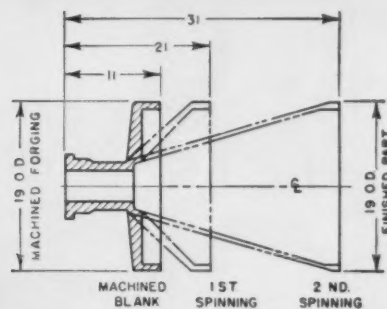
the **NEW** Cincinnati

cuts costs 1/2 to 4/5 on expensive-to-shape parts

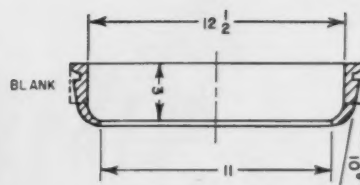
HYDROSPINNING is The Cincinnati Milling Machine Co. process for *roll-flowing* ductile metals into a wide variety of shapes having circular cross-section. A metal blank—sheet, plate, pre-formed cup, casting or forging—is caused to flow longitudinally along a rotating mandrel. Hydraulically powered rollers, capable of applying pressures up to 400,000 psi, force the metal against the mandrel to generate the desired part shape, such as those shown at right.

Parts are quickly produced, normally in one pass of the rollers. Wall thickness—straight, curved and tapered sections—can be held to tolerances as close as $\pm .004"$. The metal, having undergone a severe shear deformation, possesses increased strength, hardness and resistance to fatigue. In many instances, less costly materials have been successfully substituted for alloyed stock and heat-treating operations have been eliminated. Subsequent machining operations are usually limited to light cuts in areas that cannot be spun.

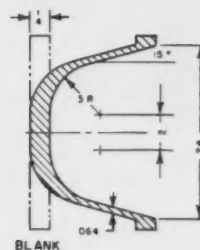
Savings on part production costs running as high as 50%—80% are now being made with the Cincinnati Hydrosprin. *Can you also profit?* For detailed information, contact the Cincinnati Milling field engineer in your area.



Turbine shaft, Hydrospon from premachined AISI 4340 alloy steel forging, in two operations.



Hood, Hydrospon from rolled and Heliarc-welded ring of type 321 stainless steel, in two operations. First roller plunge-formed groove. Second, tracer-controlled roller thinned and closed tapered wall.



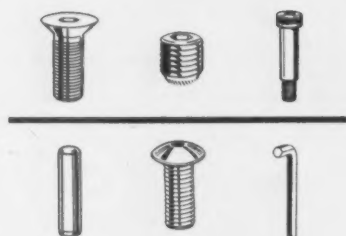
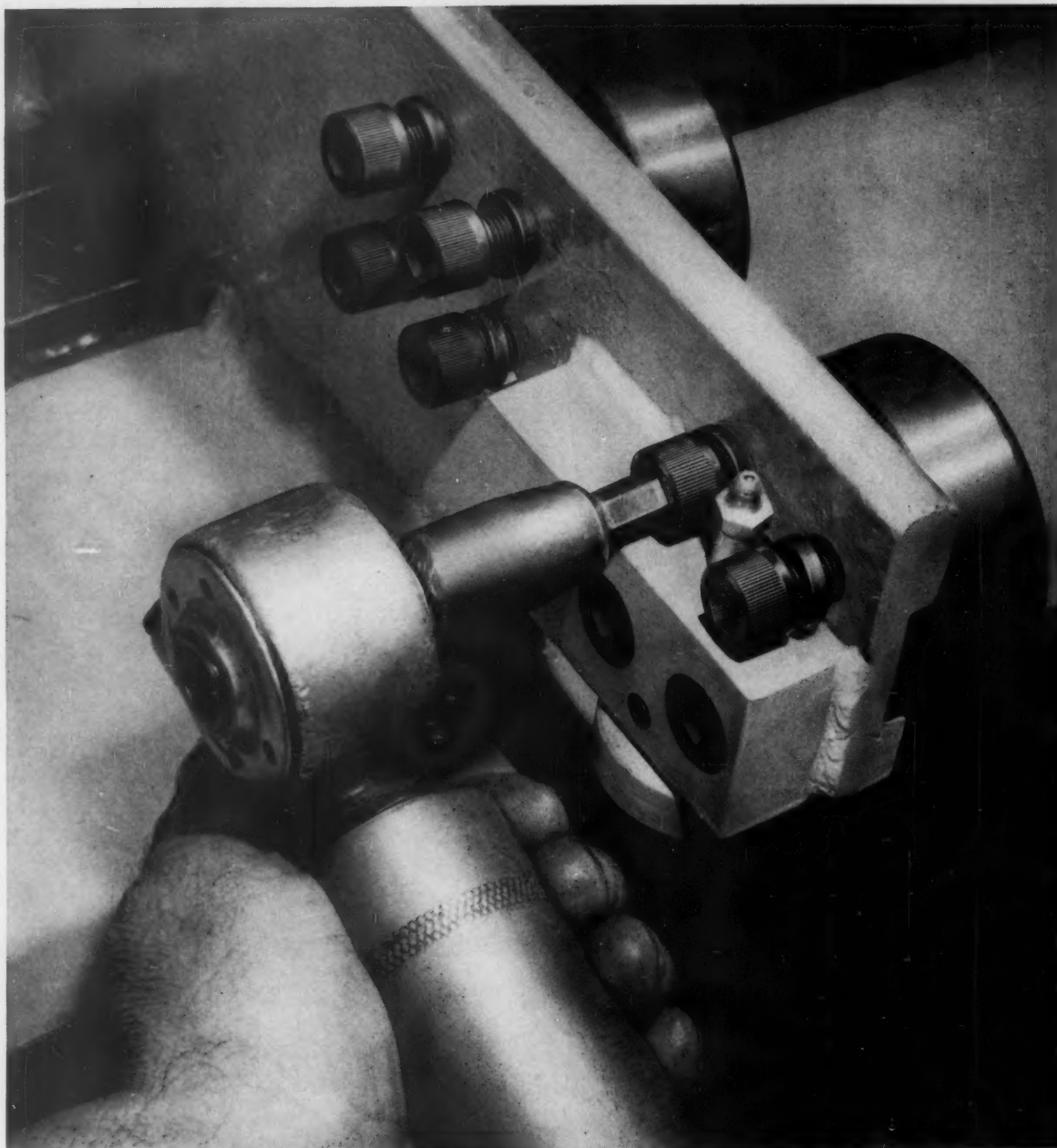
Bullet-nose shell, Hydrospon in one operation from 1/4" thick C-1020 hot rolled steel plate, using tracer-controlled roller.

CINCINNATI

Hydrospin

PROCESS MACHINERY DIVISION
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U. S. A.

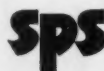
UNBRAKO AT WORK



UNBRAKO SOCKET HEAD CAP SCREWS provide additional safety and increased efficiency on industrial lift trucks. Sixteen of them are used to fasten the side thrust fork carriage rollers which reduce the stresses caused by off-center loading. These standard UNBRAKOS have heads forged for strength, and sockets of uniform depth and size for strength and maximum torque in wrenching. Fillets and threads are formed to provide continuous grain flow throughout the screw. For the UNBRAKO story, see your authorized industrial distributor. Or write STANDARD PRESSED STEEL CO., Jenkintown 19, Pa.



SOCKET SCREW DIVISION



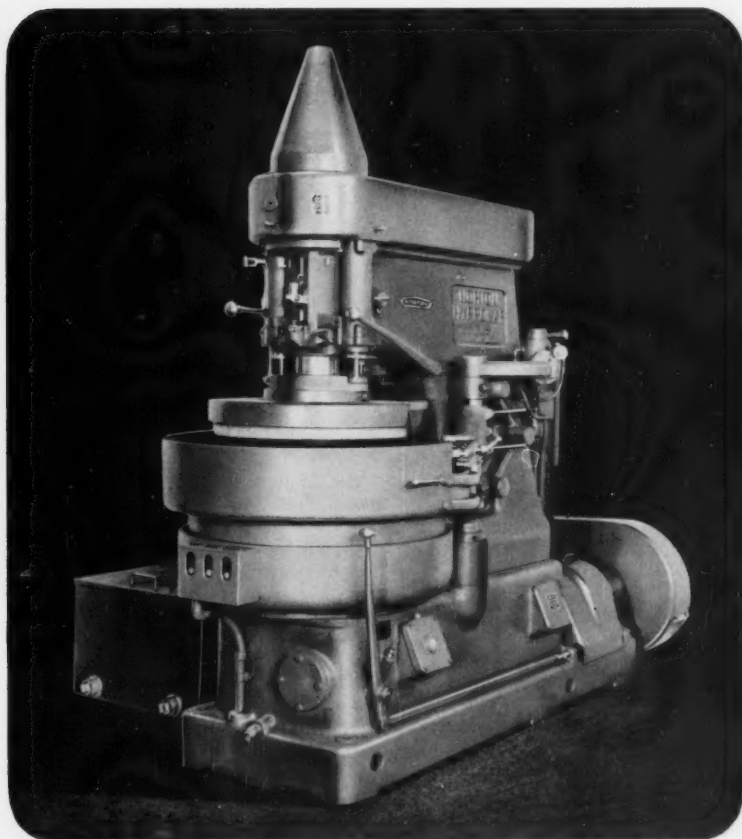
JENKINTOWN, PENNSYLVANIA

**NORTON LAPPING MACHINES meet the
widest range of applications with
SPEED...ACCURACY...ECONOMY**

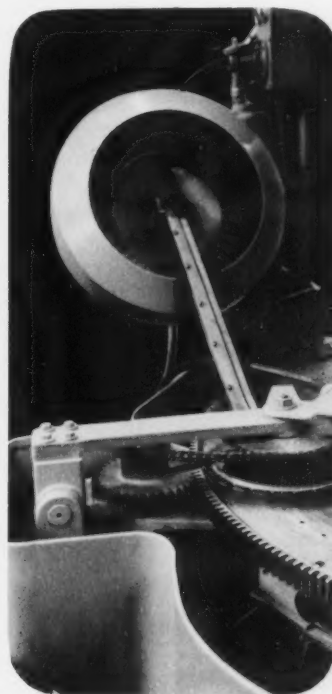
Hyprolap High Production
Lapping Machines*

As their name indicates, these machines are specifically designed for extremely fast, high production lapping. Eliminating loose abrasives, their bonded abrasive laps produce workpieces free of grit or foreign matter. Adding up

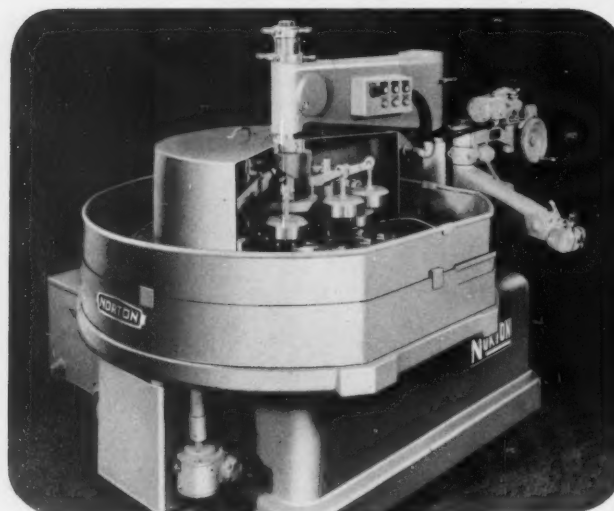
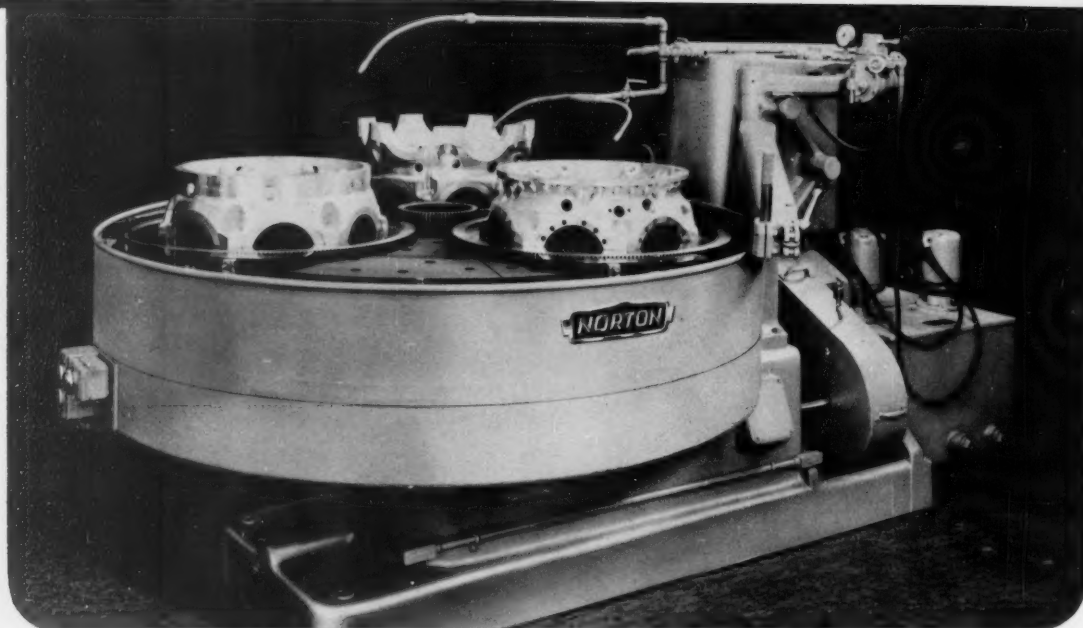
their advantages you get a combination of money-saving speed, accuracy and uniformity of finish obtainable in mass production by no other method. Four of the most popular Hyprolap Lapping Machines are shown here.



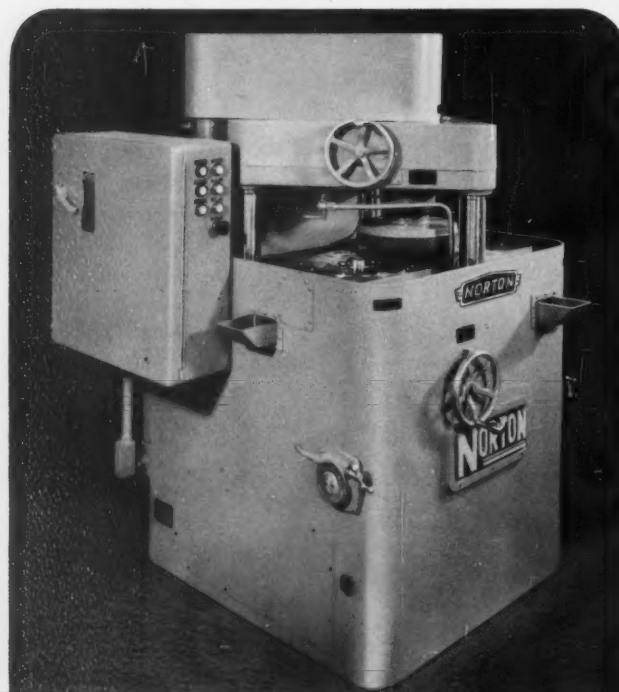
NO. 26 HYPROLAP LAPPING MACHINE. A high speed machine for flat or cylindrical lapping that finishes from 5 to 100 or more workpieces simultaneously. Lapping pressure is hydraulic powered and controlled — an exclusive Norton development. Other features include direct motor drive for laps and pumps and a hydraulic controlled truing arm. Work capacity: up to 3" thickness or diameter, to 7½" length.



THRU-FEED NO. 26 HYPROLAP LAPPING MACHINE (guards removed to show details). 10-to-1 savings proved in finishing two opposed flat surfaces simultaneously on small parts at a rate up to 8,000 pieces per hour due to uninterrupted lapping. Filling of feed hopper and removal of finished work tray are the only manual functions required. Feed is entirely automatic. High worker skills unnecessary.



HYPROLAP SINGLE FACE FLAT LAPPERS NO. 60 (Above) AND NO. 36 (Left). Sensational performers, particularly on soft metals. Provide seal surfaces, wear surfaces or reference surfaces for further machining. Arrangements are: plain timed cycle; automatic continuous feed; semiautomatic continuous feed. Power-operated truing arm and loadless-starting, inertia-delay clutch are advantage features. Available with hydraulic pressure device for lapping light workpieces. Load capacity for the 60" machine is: up to three 24" pieces or one 60" piece; for the 36" machine, up to three 11" pieces or one 36" piece. Proportionately larger loads for small workpieces.



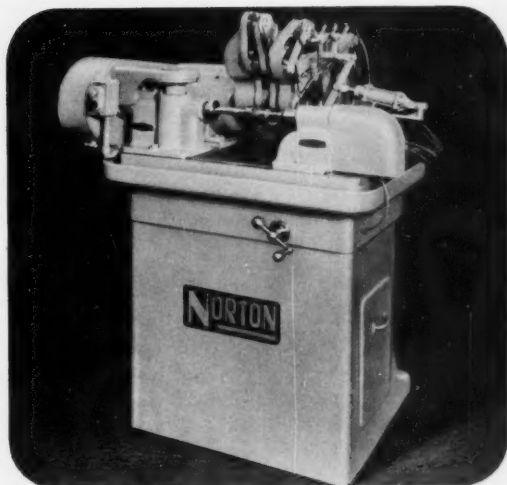
NO. 12 HYPROLAP LAPPING MACHINE. A parallel face flat lapping machine for small work. Available in three arrangements: plain, timed cycle; automatic continuous feed; semiautomatic continuous feed. All three provide fast lapping, because of the efficient action engineered into the basic machine. With all arrangements, the machine is designed to provide selective lap speed and selective work holder speed. This provides flexibility, permitting precise setting of ideal speeds for each job. With all arrangements the cleanliness of the finished surfaces — particularly on parts comprised of soft metals — eliminates the need for cleaning operations, with resulting savings in time and costs.

Three Additional Lapping Machines

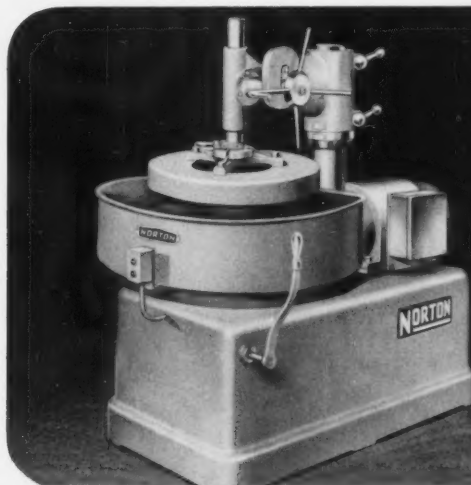
Whatever your requirements may be, here is further evidence that there is a *right* Norton lapping machine to give you maximum output and minimum downtime — with higher quality work and less dependence on manual skills.



VERTICAL LAPPING MACHINE NO. 16FC. An outstanding performer for flat or cylindrical work, such as Diesel injector parts, plug gages, size blocks, the sides of rings and short cylindrical parts. Using cast iron laps, it produces optically flat surfaces to extremely close thickness tolerances. Its fine repetitive accuracy helps reduce inspections and eliminates the need for selective assembly. Capacity range: 3" x 5" flat and 3" diameter cylindrical.



SIMPLEX SURFACE FINISHER NO. 12. A highly efficient machine that uses flexible coated abrasives. This method of surface finishing is ideal for handling small crankshafts for refrigerator compressors and outboard motors, eccentric and concentric cylindrical surfaces, journals and seal surfaces on many cylindrical parts. Capacity range: 1/2" to 2 1/2" diameter, up to 12" length.



PLAIN TIMED CYCLE LAPPING MACHINE NO. 28. Produces flat or cylindrical surfaces within extremely close tolerances and to a high degree of finish. Uses cast iron laps with loose abrasive. An attachment for cylindrical lapping is furnished with the regular flat lapping arrangement. Capacity range: flat, 4" thick x 9" long; cylindrical, 4" diameter x 9" long. An arrangement for hand lapping with 30", 36" or 40" cast iron laps is also available.

Get The Whole Story

on how Norton lappers produce finer, smoother, more accurate finishes in less time — benefits that add to the satisfaction of ultimate users of your products while increasing your own profit margin. See your Norton Representative or write to NORTON COMPANY, Machine Division, Worcester 6, Mass.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

To Economize, Modernize with NEW



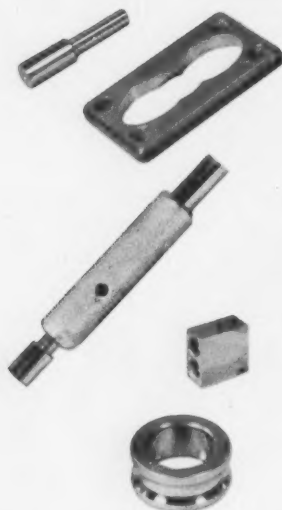
GRINDERS and LAPPERS

Making better products... to make your products better

District Sales Offices: Worcester • Hartford • New York Area, Teterboro, New Jersey
Cleveland • Chicago • Detroit. In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.



Smoothing your way to Bigger Profits



For more and more applications, lapping is resulting in better fitting, longer lasting products than could ever be produced by ordinary surface finishing methods. Thus, lapped products offer definite advantages to all who make, sell or use them.

To the inherent advantages of lapping, Norton lapping machines add their own "Touch of Gold" — the Norton *extra* that improves your product quality and at the same time increases your production. For example, Norton lappers produce:

- Superfine surface finishes at production rates, to optical flatness.
- Longer wear-life for lapped parts because of more thorough removal of surface roughness and geometrical irregularities, which would otherwise have to be removed by "running in".
- More effective liquid- and gas-tight seals without the aid of gaskets, and between piston and cylinder without the aid of rings.
- Planes finished to precision accuracy, for reference surfaces.

Norton lapping machines are made in a wide variety of types — using bonded abrasive or cast iron. Their application range covers ferrous and non-ferrous metals of all degrees of hardness, as well as various non-metals. Part sizes handled range from fractional-inch up to 60 inches in diameter.

A few of these top-performing machines are shown on the opposite side. Each includes many advanced features . . . each is easy to operate and maintain . . . and each is engineered to provide the most efficient and economical lapping obtainable within its own particular job range. It will pay you to look them over carefully, and to get further facts on how Norton lappers can add the time- and money-saving "Touch of Gold" to your own production.

The Norton Machine Lease and Purchase Financing Programs

If the cost of replacing obsolete equipment with new lapping machines is delaying your plans for modernization, investigate the Norton Machine Lease Program — three tested plans that enable you to modernize while conserving your capital. Or look into the Purchase Financing Plan, under which you may take up to five years to pay for income-producing equipment. And remember, only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost.





...and the work they do

◀ SEE INSIDE

The Norton Job Lapping Department...

A PROVING GROUND FOR INDUSTRY

Since its start two years ago the Norton Job Lapping Department has had to be considerably enlarged to take care of the growing volume of orders. Through this vital service many manufacturers have found that difficult or unsatisfactory machining operations could be eliminated by lapping, have proved the practicability of suggested limits for surface finish or dimensional accuracy of new products, or have tested the value and economy of lapping in other ways.

Complete and modern in every detail, the Department contains machines for every type of lapping, operated by expert personnel. Results are checked on the latest inspection equipment, while precision accuracy is further assured by careful atmosphere control. The extensive job-range covers the following:

Materials — practically unlimited in range, including hardened steel, stainless steel, stellite facings, cast iron, non-ferrous pressed and die-cast parts.

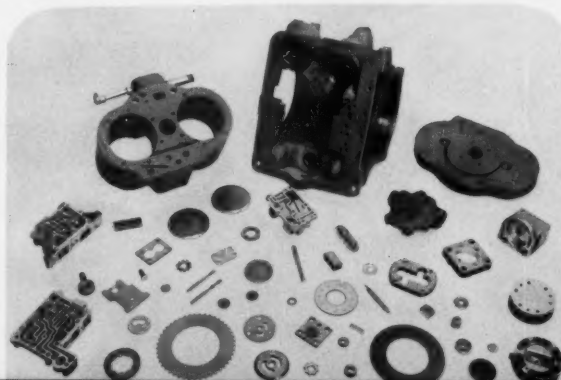
Types of Lapping. Single and parallel face flat lapping, to specifications for dimensions and for surface finish ranging from stock removal to optical flatness. Also external cylindrical lapping to high precision requirements.

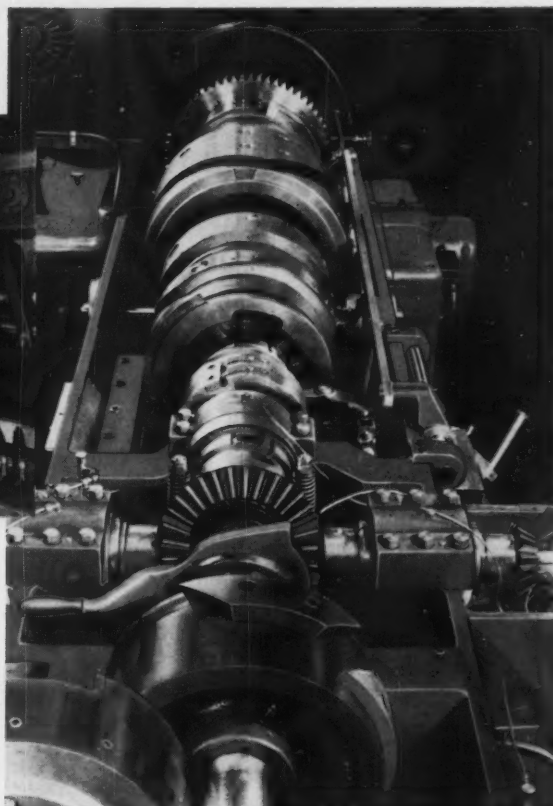
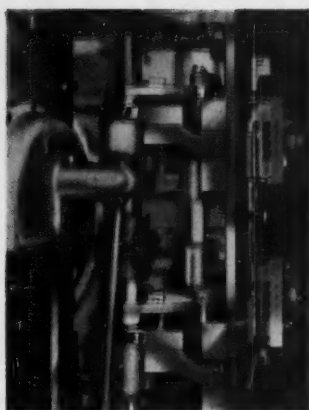
Workpiece Capacities. Flat work up to 24" across. Cylindrical work from 1/16" diameter x 1/2" long to 2" diameter x 8" long.

Why not find out how precision lapping can improve your own product quality and cut your production costs? The Norton Job Lapping Department is ready to finish parts to your exact specifications, and to work out the best technique for your requirements. Full details on request.



A corner of the Norton Job Lapping Department. Flat work up to 11" across can be handled on machines at left. The machine at right takes workpieces up to 24" diameter. Other photo shows typical parts handled by the Department.





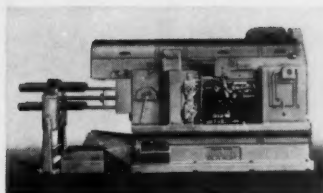
Conomatics Provide Radial Screw Adjustment of Forming Tool Slides

- Models 2 $\frac{5}{8}$ " LA, 3 $\frac{1}{2}$ " AD, 5" KL, and 5 $\frac{1}{4}$ " KR Conomatic Four Spindle Bar Machines are equipped with a number of quick job-change features. One of these is the all-position end attachment drive for the mounting of endworking opposed spindles in all positions, with independent feed to as many as three opposed spindles on a single setup.

Another feature that is of considerable importance in tooling up is the radial screw adjustment of all sideworking slides. Trial cuts may be taken to correct diameters with form tools without changing the clamped positions of the form tool holders.

All Conomatic quick changeover models are equipped with dial adjustment of the working stroke of all tool carrying slides. Besides the Four Spindle machines there are three quick change Six Spindle models in $\frac{9}{16}$ ", 1" and 1 $\frac{5}{8}$ " sizes.

Write, wire, or phone for literature.

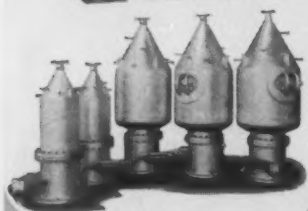
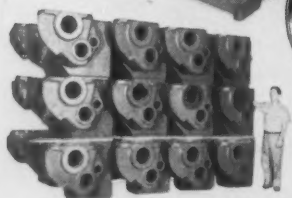
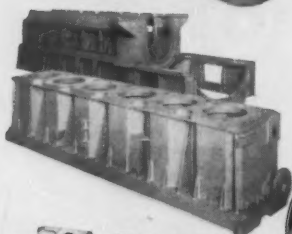
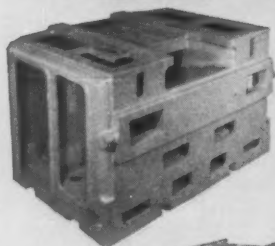
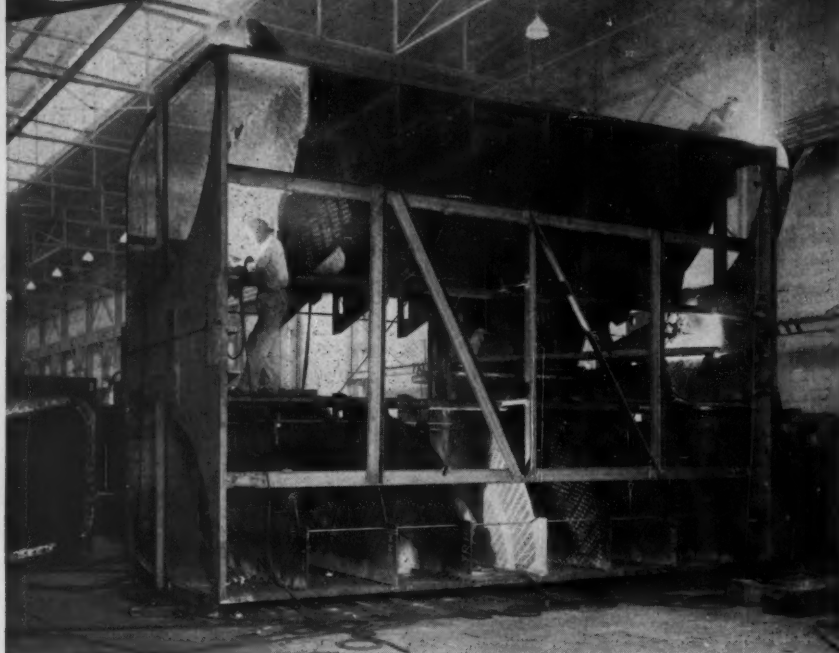


Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.



Steel-Weld FABRICATION



Use **WELDED STEEL**
for Greater Strength
with Less Weight!

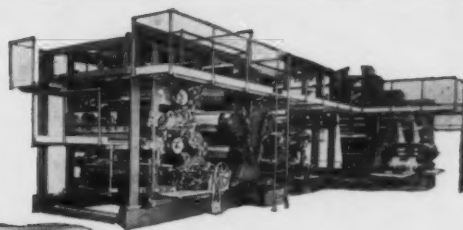
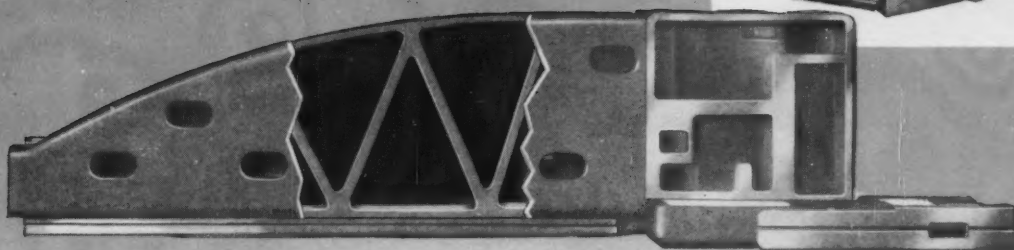


Parts, assemblies and products, such as those illustrated at left, and the steam condenser unit being fabricated in the illustration above, are typical of thousands of Steel-Weld Fabricated units produced and machined by Mahon for hundreds of manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. Mahon's service to buyers of welded structural or heavy plate fabrications is complete—including magnetic and radiographic inspection, machining, and assembling if desired. If you are a buyer of weldments, or welded steel in any form, you, too, will find in the Mahon organization a unique source . . . a source where design skill and advanced fabricating techniques are supplemented by craftsmanship which assures a smoother, finer appearing job embodying every advantage of Steel-Weld Fabrication. See Sweet's Product Design File for information, or write for Booklet showing Mahon facilities and capabilities in this field.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON



a long reach...

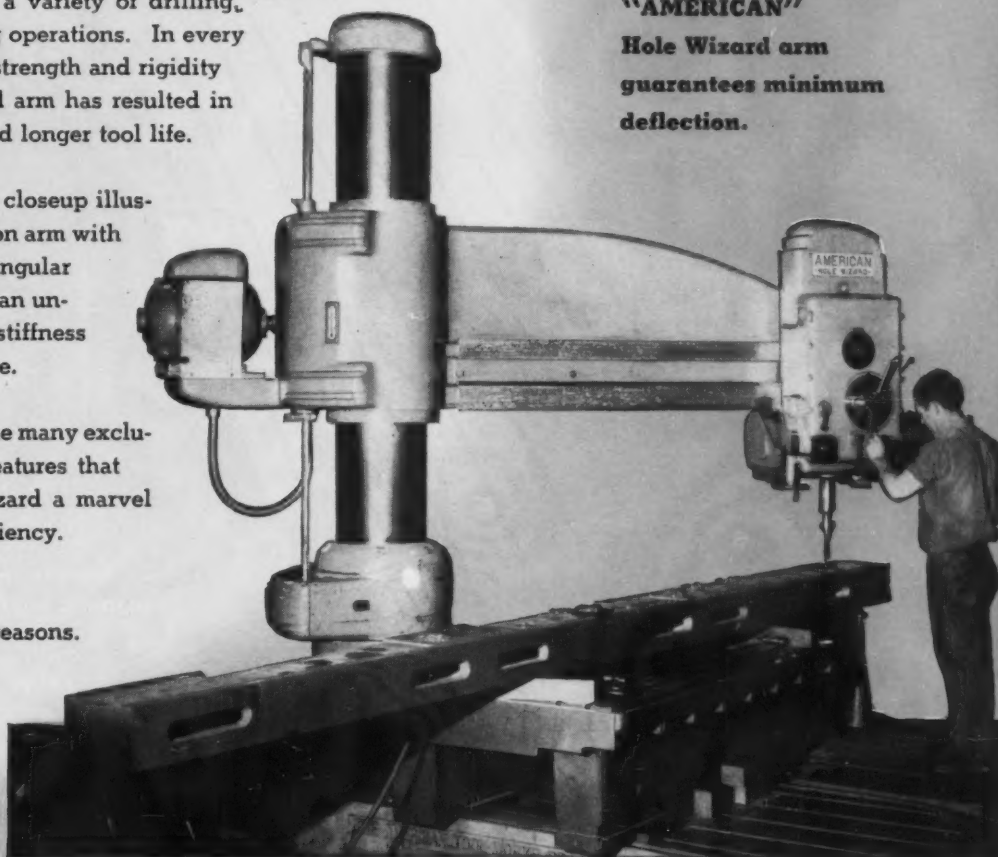
The Cottrell Company, world famed for multi-color printing press manufacture, relies on a 7' arm, 17" column "AMERICAN" Hole Wizard Radial for a variety of drilling, tapping and boring operations. In every instance the extra strength and rigidity of the Hole Wizard arm has resulted in greater accuracy and longer tool life.

The accompanying closeup illustrates the box section arm with its full length triangular ribbing, providing an unmatched degree of stiffness and stress resistance.

This is but one of the many exclusive "American" features that make the Hole Wizard a marvel of productive efficiency.

Bulletin No. 327
tells you all the reasons.

**It's a long reach
but the super-
stiffness of the
"AMERICAN"
Hole Wizard arm
guarantees minimum
deflection.**



THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

A black and white photograph of a massive industrial planer machine. The machine's bed is a long, wide metal surface with a grid of small holes. A large, rectangular metal workpiece is positioned on the bed. A worker in a light-colored jacket is standing on the left side of the machine, reaching out to adjust the workpiece. The machine's structure is complex, with various mechanical components and a large vertical column on the right side. The word "GRAY" is visible on the upper part of the machine. The overall scene conveys a sense of large-scale industrial manufacturing.

King - size

Here is one of the year's largest planers, a GRAY, immense in size, yet so superbly engineered and magnificently built that its precision performance is a marvel to behold. All GRAY planers from king-size Giants to eager Cubs are built for high production. They have more original engineering developments and production features than any other planer. They are in such demand that GRAY is the largest planer builder, further proof that *Quality doesn't cost . . . it pays.*

The G. A. GRAY Co., Cincinnati, Ohio

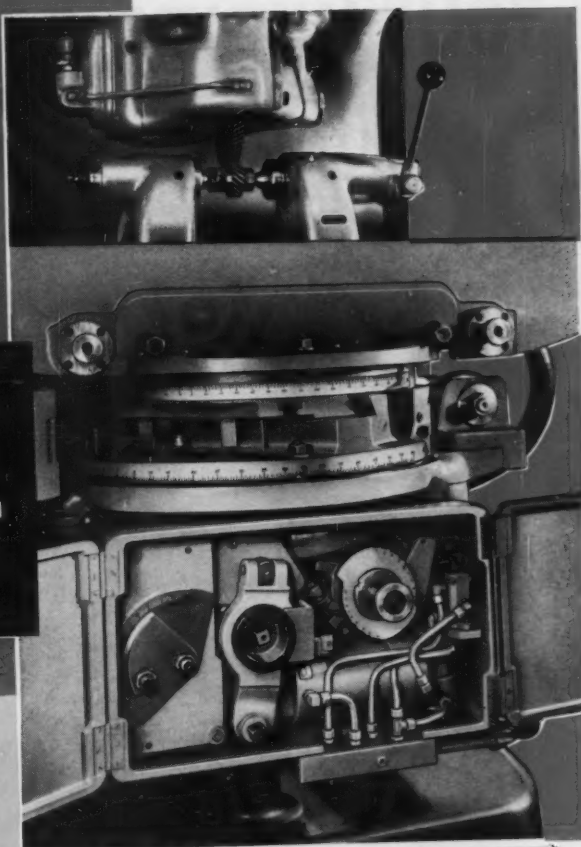
**SPEED Gear
Shaving and
Reduce Costs
with**

AUTOMATIC DIFFERENTIAL UP-FEED

Red Ring Automatic Differential Up-Feed, one of the great developments in the mechanics of gear shaving, offers you such important advantages as:

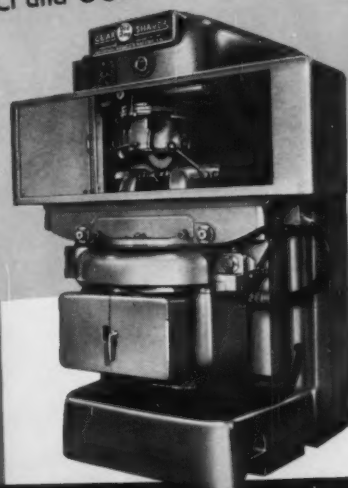
- Automatic multi-stroke shaving cycle of selected increments of feed and dwell.
- Saves 5 to 10 seconds on each work unit.
- Prolongs cutter life up to 200%.
- Eliminates operator's errors and resultant cutter breakage.
- Minimizes operator fatigue.
- Greatly reduces loading and unloading time.
- Comes from backlash into feed for first cutting stroke about three times faster than that of any other device known.

See us at the Machine Tool Show, Booth 1215.



- Every element of the cycle is positive, precise and fast.

The Automatic Differential Up-Feed is available on Red Ring Shaving Machine Models GCI and GCU.



7250

SPUR AND HELICAL
GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

*Write for
Descriptive Data*

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

For more information on products advertised, use inquiry Card, page 245

MACHINERY, August, 1955—47

Your wiping problems increase in hot weather...



ABSORPTION
Is amazing...

"Perf-Embossed"® texture
gives Scott Wipers
their dirt-gripping,
oil-drinking power



another reason for switching **to Scott Wipers**

This remarkable new product protects men and metal... steps up efficiency all year around!

Because a fresh one is always available—Scott Wipers provide a constant source of clean wiping material.

Scott Wipers are sanitary and disposable. They end the laundering problem... simplify distribution and control.

Throughout the metalworking industry, Scott Wipers are providing ready answers to wiping problems. They're two-ply and tough—yet soft and absorbent. And they stay tough even when soaked in solvents.

Compare them with whatever wiping material you're using now—for cost, convenience, performance.

The Scott representative or distributor in your area stands ready to help you set up a production line demonstration in your plant. Call him or mail this coupon today.

**And, best of all,
Scott Wipers are
DISPOSABLE!**

DISTRIBUTION

is simple... The Dispenser-box is a portable supply of 125 wipers



SCOTT PAPER COMPANY
Dept. M-C, Chester, Pa.

Please send me full information on Scott Industrial Wipers.

Name _____

Company _____

Address _____

City _____ State _____



*The man who needs a new
machine tool and doesn't buy it -
is paying for it anyway...*

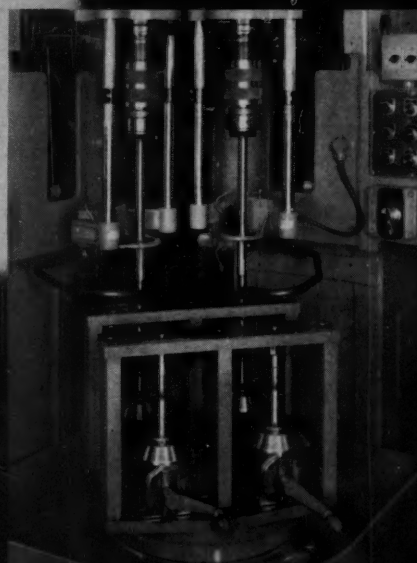
**in
scrap
losses**

Age alone doesn't obsolete machines. There are other factors. Consider the closer tolerances of two- or three-tenths now being demanded on the production line. Many a machine tool installed only five years ago can't hold to these precision tolerances. Any attempt to do so results in high scrap losses.

Consider the design of the machine. Today there is less dependence on the skill of the operator. Less subjection to human inconsistency. The built-in controls on machines utilizing the latest processing techniques minimize the problem of rejected parts.

One process with which industry obtains precision-production is Microhoning. This low-velocity abrading technique, employing low speeds and removing stock over a wide area, produces parts to exact dimensional and geometric accuracy. Microhoning uses a self-aligning tool with self-sharpening abrasives. There are no chucks to wear out of alignment; no off-tolerance parts because of dull tools or abrasive wheels needing dressing.

Check your scrap losses. Then decide whether you can afford to keep machine tools that cannot produce to current precision-production standards. You may discover that the money your scrap is costing you would buy a new Microhoning machine.



PART:

Shaft, Converter Reactor

PROBLEM:

Flame hardening caused shaft to bow, resulting in a high scrap rate.

SOLUTION:

Microhoning — removed from .004" to .008" stock from the diameter, generated a straight, round bore and eliminated scrapping of parts.

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVE., DETROIT 32, MICHIGAN

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REPRESENTATIVES: Allied Northwest Machine Tool Corp., 103 S.W. Front Ave., Portland 4, Oregon • Mason Machine Tool Company, 415 So. Second East, Salt Lake City, Utah • Parline Machinery & Supply Co., 1921 First Ave. South, Seattle 4, Washington

REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

MICRO-PRECISION DIVISION • 2205 Lee Street, Evanston, Illinois

Hydraulic controls • Diesel fuel injection equipment

Visit Booth 1211 at the Show.
See other examples of how
Microhoning can reduce scrap losses.

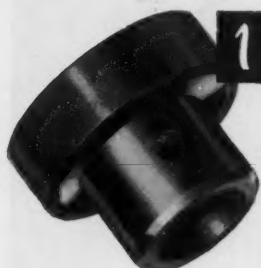
**THE
MACHINE TOOL
SHOW**

CHICAGO, ILL.
SEPT. 6-17, 1955

INTERNATIONAL AMPHITHEATRE



7 WAYS to SAVE MONEY with TOCCO* Induction Hardening



1

Cost was reduced 94% when heat-treatment of this corn-harvester part was changed from carburizing to TOCCO-hardening, 9½¢ saved on every piece — \$4750 on each 50,000 piece batch, plus an hourly production increase from 120 to 300 pieces per hour.



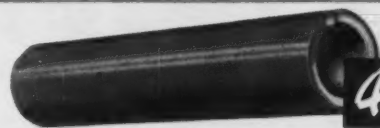
2

Leading automotive companies need and use TOCCO hardened axle shafts to handle higher horsepower. Better, yet cheaper—savings of \$375.00 per day. Less machining costs, lower priced material, increased production, and a plus in quality—200% greater torsional life.



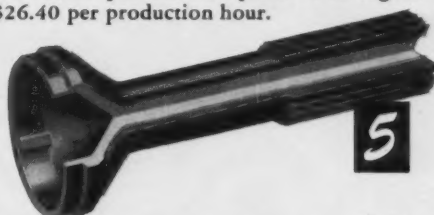
3

Kearney & Trecker Corp. reduced the cost of hardening this milling machine part from \$1.57 to 10¢ apiece. In addition TOCCO made possible a switch from alloy to S.A.E. 1045 steel—saving another 11¢ per piece in material cost. Kearney & Trecker hardens 140 different parts on one TOCCO unit.



4

Thompson Products Ltd. boosted production of these automotive wrist pins from 500 to 1200 per hour when they switched to TOCCO-hardening. Costs fell from \$5.45 to \$3.25 per hundred parts—a savings of 2¢ per pin, \$26.40 per production hour.



5

Mechanics Universal Joint Division of Borg-Warner reports a 69% savings in the hardening of stub ends for propeller shafts. TOCCO also upped production from 35 to 112 parts per hour—over three times as fast as conventional heating methods.

Lima-Hamilton Corporation adopted TOCCO for hardening this shifting lever. Results: a savings of 4¢ per piece—\$25 per production hour. TOCCO costs only 17% of former heating method. This is only 1 of 139 parts TOCCO-hardened by Lima-Hamilton Corp. All show savings over usual heating methods.



6

7

Number 7—the lucky number—is up to you. Why not add your name to the list of companies who use TOCCO Induction Heating to increase production, improve products and lower costs. TOCCO engineers are ready to survey your plant for similar cost-saving results—without obligation, of course.

THE OHIO CRANKSHAFT COMPANY



TOCCO

NEW FREE
BULLETIN

Mail Coupon Today

THE OHIO CRANKSHAFT CO.

Dept. M-8, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating."

Name _____

Position _____

Company _____

Address _____

City _____ Zone _____ State _____

For more information on products advertised, use Inquiry Card, page 245

MACHINERY, August, 1955—51

ARMSTRONG



The ARMSTRONG Threading Tool takes interchangeable high speed steel form-cutters which require only flat top grinding to resharpen—always hold their true thread form.

See us at Booth #550 Metalworking Machinery & Equipment Exposition Chicago Coliseum, Sept. 6-17.

Each year ARMSTRONG TOOL HOLDERS become more important to you

Every rise in labor costs, every added tax, every overhead burden, every increase in cutting steel prices, every new, more costly machine tool, all increase the importance of ARMSTRONG TOOL HOLDERS to profitable operation.

ARMSTRONG TOOL HOLDERS reduce direct tooling costs to an absolute minimum—"Save: All Forging, 70% Grinding, 90% High Speed Steel."

ARMSTRONG TOOL HOLDERS reduce tooling-up time to minutes, to the selection and adjustment of the holder and cutter.

ARMSTRONG TOOL HOLDERS permit increased speeds and feeds—produce more pieces per hour per machine tool.

ARMSTRONG TOOL HOLDERS are efficient for they embody a perfection gained by over 50 years of specialization in the development and refinement of tool holders.

ARMSTRONG TOOL HOLDERS are inexpensive because they are quantity produced by modern methods, for a world market...are used by over 96% of the machine shops and tool rooms...are carried in stock for your convenience by all industrial distributors of consequence.

Write For Catalog



ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5213 W. ARMSTRONG AVENUE CHICAGO 30, ILL.



A light touch

FOR HEAVY PRODUCTION

New concepts of hydraulic headstock design permit a blending of operator skill and machine response never before achieved . . . all resulting in effective use of a wider choice of speeds and extra heavy duty metal cutting capacity.

THE WARNER & SWASEY COMPANY • CLEVELAND 3, OHIO

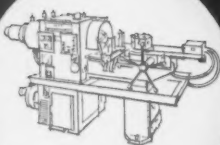
SEE

DOWN • TO • EARTH

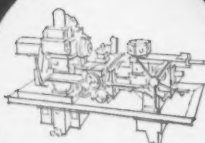
SHOP JOBS

AT 717

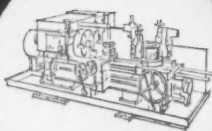
THE
MACHINE TOOL
SHOW
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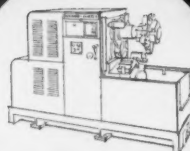
Electro-Cycle
Turret Lathes



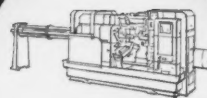
Ram Type
Turret Lathes



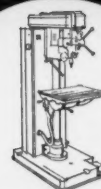
Saddle Type
Turret Lathes



Single Spindle
Automatics



Multiple Spindle
Automatics

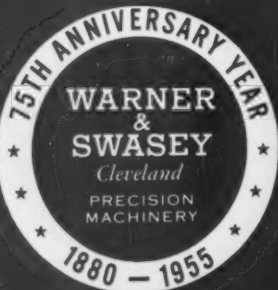


Precision Tapping
Machines

Machine designs change, but practically all these changes are made to improve methods for machining jobs such as you have in your own plant right now!

That's what we believe you want to see at the Machine Tool Show—better methods for doing your work. And that's exactly what you'll see at the Warner & Swasey booth . . . the most modern machines, utilizing the latest production techniques, turning out typical shop jobs.

We believe you will take home an important "souvenir" of your visit to Booth 717 . . . ideas on how you can machine metal more efficiently, more profitably!



NO MATTER WHICH WAY YOU TURN . . .
WARNER & SWASEY CUTS COSTS

TAREX

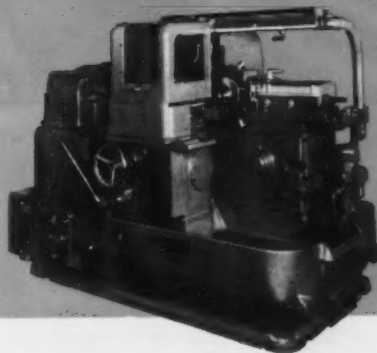
AUTOMATICS

... here's JUST ONE of the salient features of this machine which is made with SWISS PRECISION throughout:

 **FOUR
ROBUST
SLIDES!**



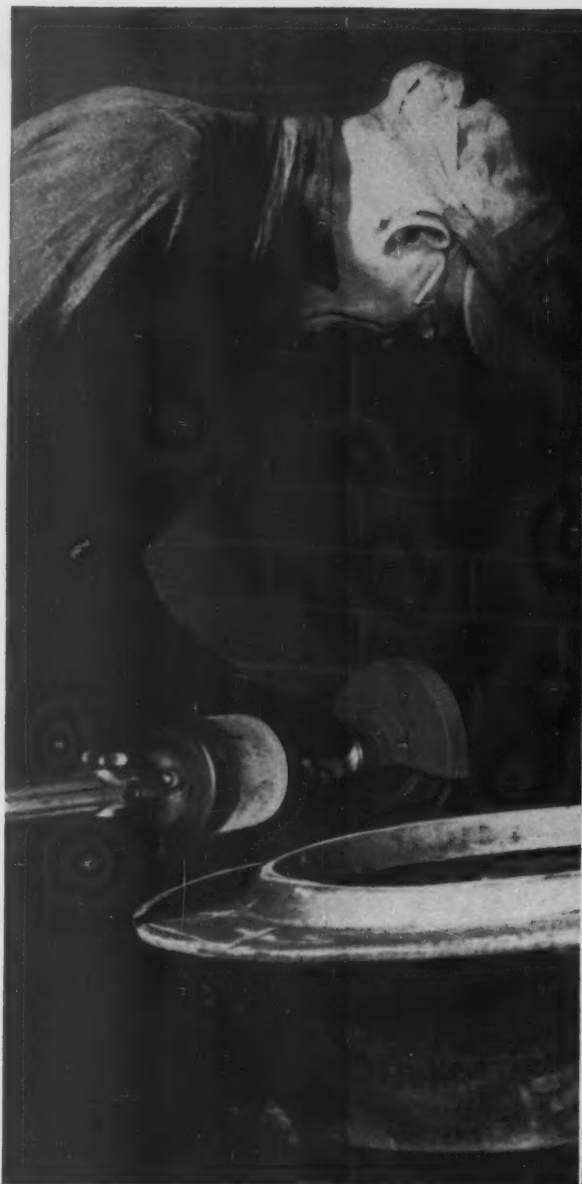
The front and rear slides mounted on crossed ways, permitting radial or lateral movements, or combined to produce tapers or irregular forms. This allows the use of single point tools in many cases in place of form tools with their inherent side thrust. All tool slides actuated by camming systems having adjustable ratios. (The two upper slides are radial only). Machine throughout is engineered to take American-made tools!



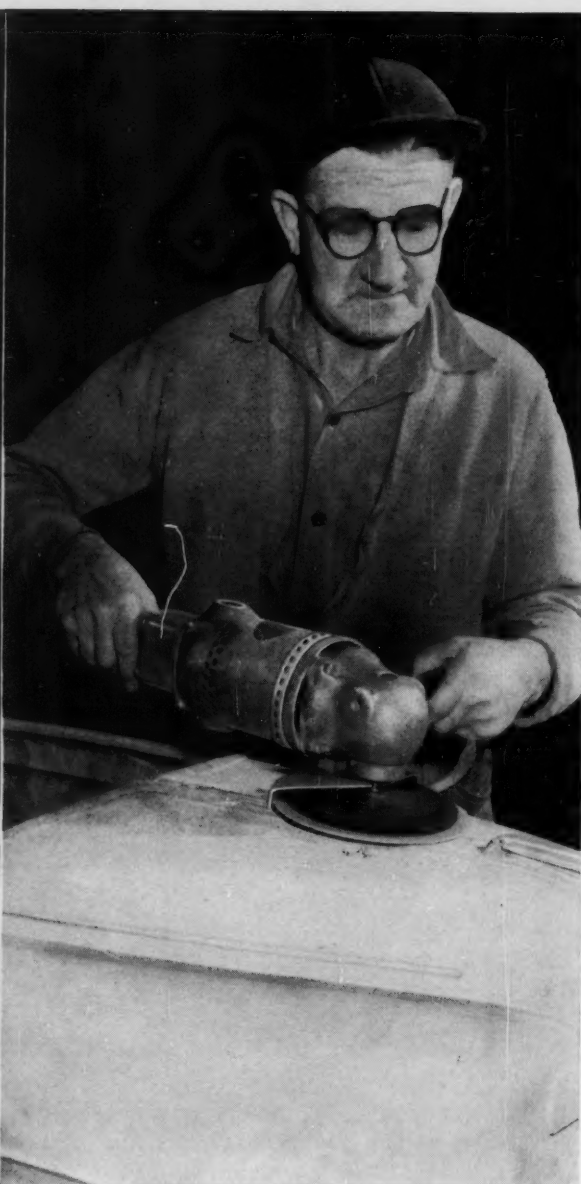
COMPLETE TOOLING and SERVICE in AMERICA.

RUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.



Reducing welds with straight wheel



Blending welds with depressed center wheel

on every

CUT COSTS

YOUR CARBORUNDUM DISTRIBUTOR OR SALESMAN will show you which of these products is best for each of your operations...and why! Call him today—he's listed in the yellow pages of your phone book under "Abrasives" or "Grinding Wheels." Years of experience, unbiased counsel, complete stocks of abrasives and fast, dependable service make him your one source for help on every grinding and finishing problem. Or, if you prefer, write to The Carborundum Company, Dept. M 81-54, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.



Rough grinding with cup wheel



Cleaning casting with cone wheel

PORTABLE GRINDING *job!*

Are *you* getting maximum production at lowest possible cost from your portable grinding operations? There's **ONE** way to be sure—use the proper abrasive product by Carborundum for every type of portable grinding machine—

air or electric—in your shop.

YOUR WIDEST CHOICE of abrasives by CARBORUNDUM assures you of the *one* best suited to every metalworking operation, whether you're rough grinding or snagging...weld grinding or de-

burring...smoothing edges, finishing or polishing. Choose from *seven* different types of wheels, including straight wheels, cups, rubber-bushed wheels, mounted wheels or versatile MX® and CARBOFLEX products.

CARBORUNDUM

REGISTERED TRADE MARK

...continually putting more **SENSE** in your abrasive **DOLLAR**

81-54

For more information on products advertised, use inquiry Card, page 245

MACHINERY, August, 1955—55



In Chicago...
you'll see for the first time

A NEW LINE OF GISHOLT MACHINES

identified by
this
medallion:



The new Gisholt MASTERLINE medallion identifies this new and improved series of machines—and re-emphasizes Gisholt achievements in building the master tools of industry since 1887.



Based upon nearly 70 years of specialized experience, the new Gisholt MASTERLINE machines are ready to give you production far in advance of their time.

Come in and inspect them at close range. Watch them operate. Learn what these new Gisholts can do to cut costs on your work.

Be sure to visit the Gisholt exhibit—Booth 1413, Exhibition Hall.

GISHOLT

MACHINE COMPANY

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

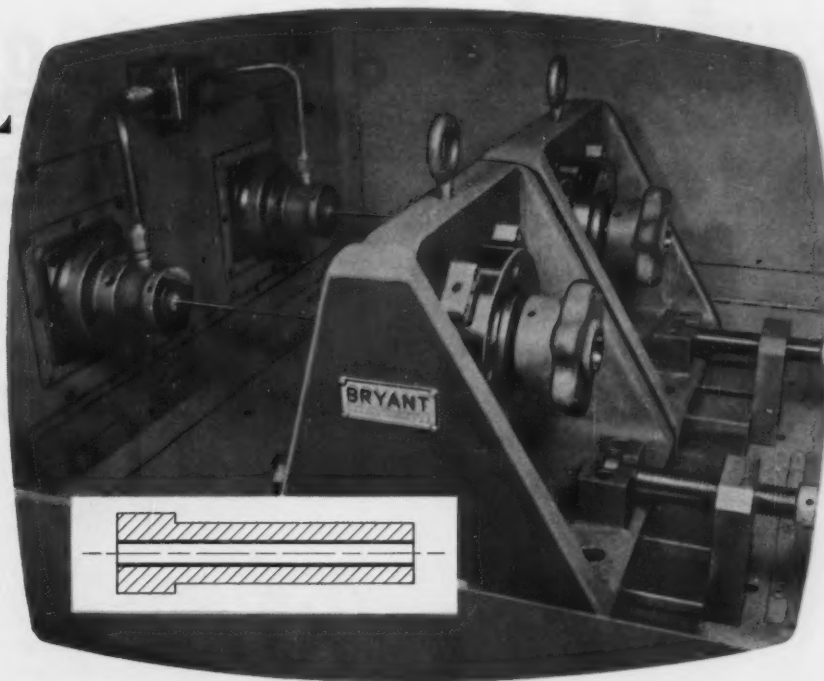
~~CANCEL~~

secondary
operations

on tough

drilling jobs

like this



with the BRYANT precision boring machine!

Part—Phosphor Bronze Bushing

Operation—Precision drill hole from solid

Hole dimensions— $.300 \pm .002$ dia. x $3\frac{3}{4}$ " long

Cutting Speed—5000 R. P. M., 395 S. F. M.

Feed—3.5 I. P. M.

Finish required—8 to 10 Micro-inches

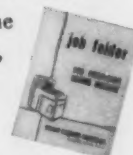
Production—96 pieces per hour at 100%

Better finish, more accurate holes and improved production at lower cost per piece result when difficult deep hole drilling jobs are done on the Bryant Precision Boring Machine.

In many cases secondary operations such as lapping or reaming are eliminated, providing further savings.

The versatile Bryant 998 is designed to allow rapid interchange of fixtures and tooling for machining a wide variety of parts. Its table is actuated mechanically by a precision cam and lever unit—providing constant tool control.

The Bryant pre-loaded ball slide construction supporting the table assures fine finishes and accuracy in precision boring, drilling, turning, facing, grooving and precision contouring. Write for Bryant 998 Job Folder.



**Be sure to see the Bryant 998
Precision Boring Machine
demonstrated at the
Machine Tool Show...
Booth 1015**



chucking grinder co.

20 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia
Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

For more information on products advertised, use inquiry Card, page 245

MACHINERY, August, 1955—57

B-52 wings get a lift



This huge press, installed at Boeing-Wichita where it produces inner skins, wing stiffeners and similar components for the B-52, has three features that are proving a boon to cost-conscious Boeing engineers and taxpayers alike:

- Its tremendous power allows Boeing to *heat-treat parts prior to forming*—giving them the added strength they need.
- The rubber pad slashes tooling time and costs—a significant advantage in short-run production.
- The two die slides boost output: while one is in the press, the other is loaded.

Like all Bliss Hydro-Dynamics, regardless of size, this press is fast starting, quick on the approach and return (300" per minute). Its controls are simple, and operation foolproof.

If you believe that a hydraulic press may solve your production needs, let a representative give you the benefit of Bliss' experience. Since Bliss manufactures a complete line of hydraulic and mechanical presses, you can be sure of an impartial recommendation—a recommendation that results in the one *right* press for the job.

STRESSES HERE

...ARE OVERCOME HERE

BLISS

SINCE 1857

is more than a name...it's a guarantee!

E. W. BLISS COMPANY, Canton, Ohio
PRESSES, ROLLING MILLS, SPECIAL MACHINERY

with a 7000-TON "SQUEEZE"



TWO STORIES HIGH, this press is essentially a single action press of open-rod "moving down" construction, with the slide guided on all four rods. Despite its mass, however, it can be precisely controlled: the operator can inch the slide to the work and stop it at any point in the stroke.

U. S. Plants in Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; San Jose, California; Midland and Pittsburgh, Pa. Branch Offices in Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Pittsburgh, Philadelphia, Rochester, San Jose, Toledo, Washington, D. C.; and Toronto, Canada; E. W. Bliss (England) Ltd., Derby; E. W. Bliss Co. (Paris), France. Other representatives throughout the world.

THE
MACHINE TOOL
SHOW

CHICAGO, ILL.
SEP. 8-12, 1955



"SQUEEZE" A NUT WITH A MAGNATIC



Reversible Nutrunner

Chicago Pneumatic Tool Company, Dept. M1
8 East 44th Street, New York 17, N. Y.

☐ Please send me FREE booklet SP-3164 "Magnamatic Case Histories."
☐ Please send me "Magnamatic" Bulletin SP-3126.
☐ Have representative call.

NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

NEW!

Controlled-Torque
power
screwdriver-
nutrunner

the revolutionary CP "Magnamatic"

with the
one-shot clutch



An air-driven torque screwdriver-nutrunner that can be preset to run one screw or thousands* to specified torque ... that's the CP One-Shot "Magnamatic."

In design and operation "Magnamatic" is entirely new, but thoroughly proved in more than eighteen months of field testing and operation on production lines:

— an Alnico magnetic One-Shot clutch, adjustable to specified torques, disengages *completely* the instant the fastener is driven to the desired tightness. The clutch does not impact or ratchet—the irritating "buzz" of conventional tools is eliminated. Inexperienced or fatigued operators can't burr screw heads, strip threads, shear fasteners, or damage work surfaces. It is impossible to overdrive a nut or screw with a CP "Magnamatic" no matter how long the tool is held on the work.

A complete line of One-Shot "Magnamatic" Screwdrivers, reversible and nonreversible types, in capacities from #4 screws to 3/8" bolt size, is now in production.

*On the assembly line of a midwestern manufacturer, an operator is running 16,000 #6-32 screws per day with "Magnamatic" to a critical torque specification.



Reversible
Screwdriver



Screwdriver

ONE-SHOT "MAGNAMATIC" SCREWDRIVER · NUTRUNNER

- can be preset to drive fasteners to specified torques.
- maintains the selected torque setting indefinitely.
- has no clutch jaw wear.
- disengages the instant the fastener is run to desired tightness.
- eliminates the need for skilled operators.
- eliminates stripped threads, sheared fasteners, surface damages.
- prolongs service life of screw bits.



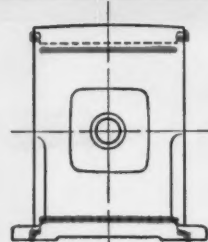
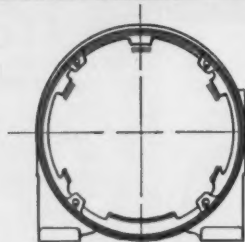
Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



PROBLEM

1. lower stator frame machining costs.
2. increase production and accuracy
3. run any one of four different size parts



MACHINING NECESSARY

Drill 8 holes
Chamfer 8 holes
Tap 8 holes

Bore two inside diameters
Rough face ends
Remove chips



for problems in Drilling, Boring, Facing and Tapping

Call a Nates Field Engineer

CHICAGO, Room 203, 6429 W. North Ave., Oak Park
DETROIT, 10138 W. McNichols Rd. • BUFFALO, 1807 Elmwood Ave.
NEW YORK, 35 Beechwood Ave., Mount Vernon

NEW NATCO HOLEWAY

*cuts costs and increases production . . .
and accuracy by combining operations!*

SOLUTION



OPERATIONS

STATION No. 1

Load 1 part.

STATION No. 2

R. H. Horizontal Head
Combination rough bore for
10.492/10.490 half thru,
rough bore for 12.064/
12.062 diameter, finish bore
10.520/10.510 diameter and
rough face end.

L. H. Horizontal Head
Drill 4 holes

STATION No. 3

Idle

STATION No. 4

R. H. Horizontal Head
Drill 4 holes

L. H. Horizontal Head
Combination rough bore for
10.492/10.490 diameter
rough bore for 12.064/12-
062 diameter and rough face
end.

STATION No. 5

Idle

STATION No. 6

R. H. Horizontal Head
Tap 4 holes

L. H. Horizontal Head
Tap 4 holes

STATION No. 7

Idle

STATION No. 8

R. H. Horizontal Head
Idle

L. H. Horizontal Head

Finish bore to 10.492/10.490
diameter thru.

STATION No. 9

Blow chips out of center bore
and 8 tapped holes (4 each
side) and blow chips off top.

STATION No. 10

Unload 1 part. Part to be un-
loaded onto gravity conveyor.

30

ESTIMATED GROSS PRODUCTION

PARTS PER HOUR

(ANY ONE OF FOUR DIFFERENT SIZE PARTS)

NATIONAL AUTOMATIC TOOL COMPANY, INC.

RICHMOND, INDIANA



This is a fast

Every hour, this Newton Vertical Rotary roughs and finish mills the tops of 600 aluminum pistons at 85% efficiency.

The machine automatically clamps, unclamps and ejects the finished pistons onto a conveyor. All the operator does is load!

A Newton Vertical Rotary is more than a machine tool—it is a method—the fastest known method of milling the flat surfaces of repetitive pieces!



CONSOLIDATED MACHINE TOOL

A DIVISION OF FARREL-

BIR

one!



For aluminum milling, Newton Vertical Rotaries have high speed Vee belt drives and feeds up to 100 inches per minute.

COMPANY, ROCHESTER 10, N. Y.

BIRMINGHAM CO., INC.



AGAIN...LATHE LEADERSHIP

15

NEW

PowerTurn

LATHES

NEW FEATURES FOR ADDED PRODUCTIVE CAPACITY
AND GREATER OPERATING CONVENIENCE... WITH TRADITIONAL
LODGE & SHIPLEY ACCURACY AND RUGGED STRENGTH

With apologies to so many loyal lathe users who've stoutly claimed Model X Lathes as the "greatest ever" here's a worthy successor to that famous series!

From headstock to tailstock... and down to the floor... POWERTURN Lathes are newly designed to facilitate turning to higher levels of profitable lathe operation. New features add importantly to Lodge & Shipley Lathes' ability to produce more at lower costs.

Start turning problems into profits... make your next lathe a Lodge & Shipley POWERTURN Lathe... newest and best! The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

13", 16" and 20" Standard—Engine, Toolmaker, Gap, Manufacturing and COPYMATIC Types

HEADSTOCK

... Computing head with time-saving speed selection, positive brake, built-in horsepower ammeter

CARRIAGE AND APRON

... greater swing over cross slide, micrometer indication of carriage movement, hardened and ground, steel cross slide ways

FEED AND THREAD GEARING

... new tilted index plate and levers for easy selection

CROSS FEED AND TOP SLIDE DIALS

... large, direct reading in .001" diameter increments

COMPOUND REST

... square base rest reduces overhang, increases strength

BED AND BEDWAYS

... new chip and coolant pan, easy mounting of guards, removal of chips

TAILSTOCK

... spindle hardened and ground, front-mounted handwheel, tailstock quickly moved, positively locked

THE
MACHINE TOOL
SHOW
CHICAGO, ILL.
SEPT. 9-17, 1959
INTERNATIONAL ENGINEERING



new POWERTURN
literature available now!

Bulletins:

- #302—13" Engine Lathe
- #303—16" Engine Lathe
- #304—20" Standard Engine Lathe
- #305—13" Toolmaker Lathe
- #306—16" Toolmaker Lathe
- #307—20" Standard Toolmaker Lathe

POWERTURN LATHES are available on Lodge & Shipley Lease and Deferred Payment Plans, details on request.

FROM LODGE & SHIPLEY!

Featuring the time-saving new

Computing HEAD

... fast, fool-proof indication of speed lever settings!

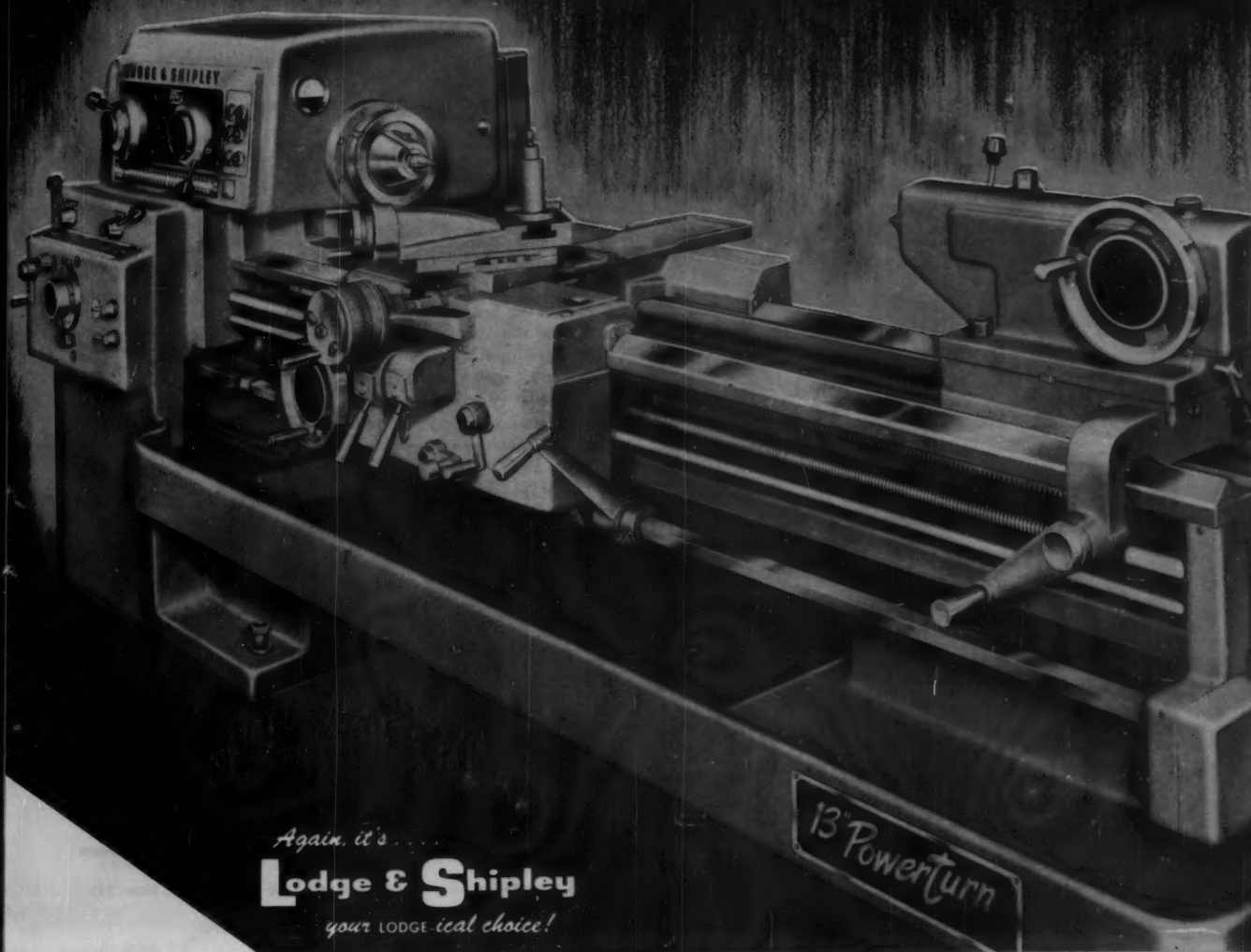
and, *Centri-trol* CONTROLS

... all controls conveniently grouped, distinctively shaped!



See it NOW... See it at The MACHINE TOOL SHOW!

SEPTEMBER 6th-17th, BOOTH NO. 502



Again, it's

Lodge & Shipley

your LODGE-ical choice!



STANDARD

®

Dial Bore GAGES

World's WIDEST Range!

World's SMALLEST Dial Bore Gage!

NOW down to 1/16"



STANDARD GAGE, originator of the efficient, dependable, easy-handling, easy-reading Dial Bore Gage, now offers the world's widest range in these instruments, covering diameters from 1/16" up!

Wholly self-contained, light in weight, simple to handle, each size, largest to smallest, is highly accurate and practical for use at machine or inspection bench.

SMALLEST DIAL BORE GAGE IN THE WORLD

The newest member of the family, No. 8/0, covers a range from .062" to .079". It is one of a group of seven mini-size gages with a range from .062" to .380". Utilizing STANDARD's unique centering-size disc principle, these gages are automatically positioned in the bore, with a solid reference point directly opposite the gaging plunger. Easy interchange of discs permits quick conversion to various sizes within the over-all range of the gage. Discs may be had to fit individually specified bore dimensions or in complete sets for each size gage. For example, nine discs in progressive sizes are available in the .062"-.079" range of No. 8/0; twenty-seven discs in the .247"-.380" range of No. 2/0.

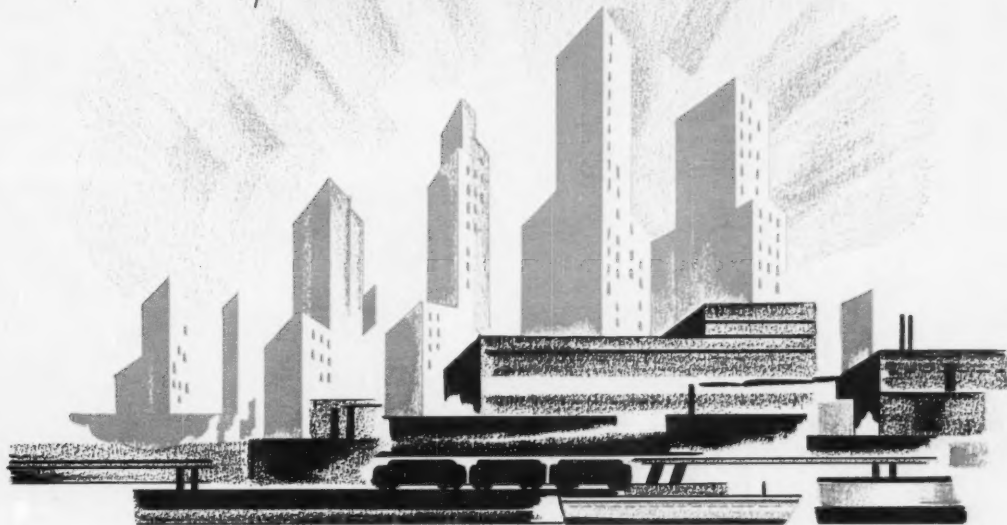
STANDARD Dial Bore Gages are available in pistol-grip types, vertical types and special types to meet unusual needs. Bring your bore gaging problem to STANDARD; simple or difficult, we have a Dial Bore Gage to solve it.

Write for detailed information

STANDARD GAGE COMPANY, INC.
32 PARKER AVENUE • POUGHKEEPSIE, N. Y.

MACHINE TOOL

Show



Chicago



Plan now to attend the Machine Tool Show at the International Ampitheatre in Chicago. You are invited to visit the booths of these Rockford machinery builders and see some of the world's best investments in action.

Rockford Insert Group

August, 1955

Barnes Drill Co.
Barber-Colman Company
Hendey Machine Division
Barber-Colman Company
Greenlee Bros. & Co.
John S. Barnes Corporation
Mattison Machine Works
Rehnberg-Jacobson Mfg. Co.
Rockford Machine Tool Co.
Sundstrand Machine Tool Co.
American Broach & Machine Company
DIVISION OF
Sundstrand Machine Tool Co.
W. F. & John Barnes Co.

*Keep gathering metal-working
production ideas . . . be well
informed when the time for
replacement arrives*

Here's Your Answer To High Production Turning:

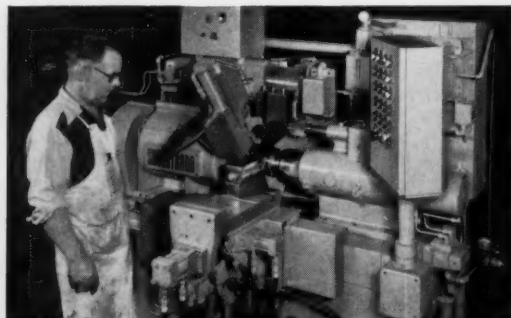
1 Sundstrand
"Engineered
Production" Using...

2 Sundstrand
Automatic
Lathes Plus...

3 Automatic
Handling

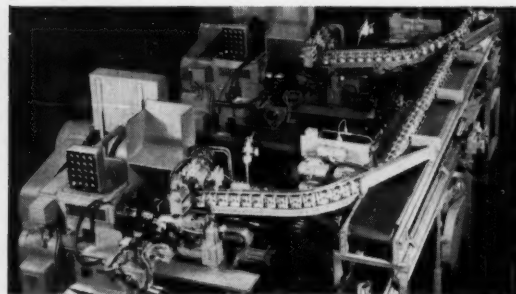


Sundstrand "Engineered Production" means designing and building machinery for the job at hand while using all the skill and advanced facilities available. For instance, here are seven interesting lathe installations, each of which is provided with automatic work handling coupled with automatic machine cycling...



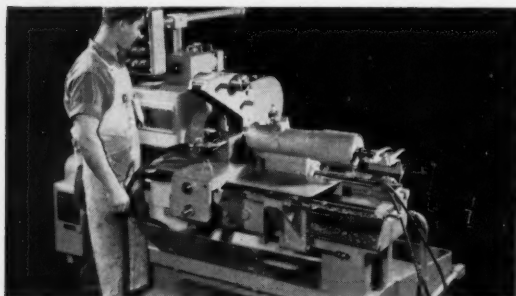
Turning, Handling and Gaging Automatically

Automatic handling, machining and gaging of stator cores is performed on this Sundstrand Lathe. Parts are fed in by gravity, automatically loaded, turned, chamfered, gaged and ejected. Gaging is interlocked with automatic tool advancement of .0005". After 5 settings, the machine stops automatically for tool changes. Production is 154 parts per hour.



Turning, Facing, Chamfering and Grooving 376 Pistons Per Hour

Continuous automatic cutting cycles of these two Sundstrand Lathes combine with automatic loading, unloading and conveyance of parts for a high degree of automation in machining automobile pistons. Each machine turns, faces, chamfers and grooves for a total production of 376 pistons per hour.



Turning with Hopper Loading

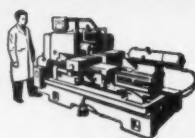
Spacer tubes are turned on this Model 6A Lathe. Everything is done in automatic programmed sequence from gravity hopper feed loading (above the turning operations) to final ejection of work to unloading chute below. Production reaches 136 parts of steel and 68 of titanium per hour.

SUNDSTRAND

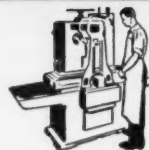
50 YEARS OF
"Engineered
Production"
Service*

*REG. U.S. PAT. OFF.

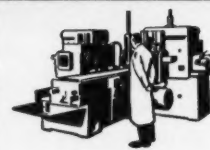
AUTOMATIC LATHES



SIMPLEX RIGIDMILLS



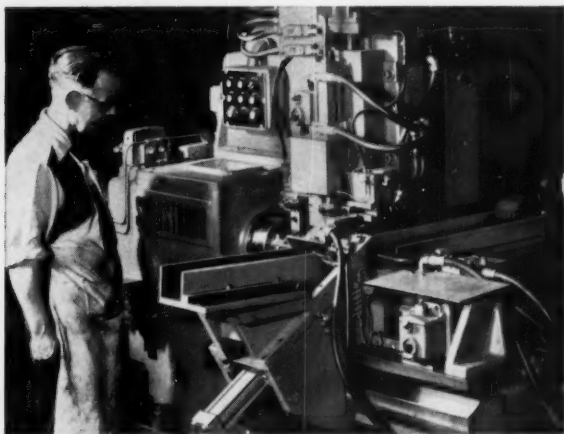
DUPLEX RIGIDMILLS



Machinery, August, 1955

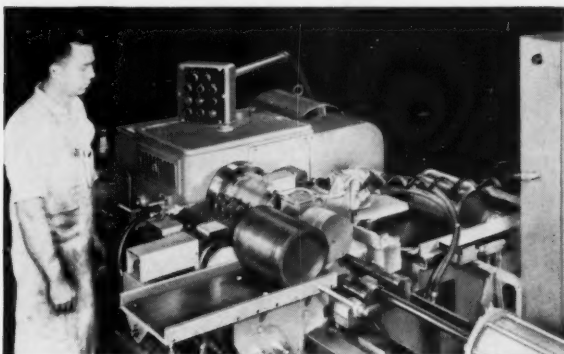
MACHINES DESIGNED TO MEET YOUR NEEDS

ROCKFORD, ILLINOIS, U.S.A.



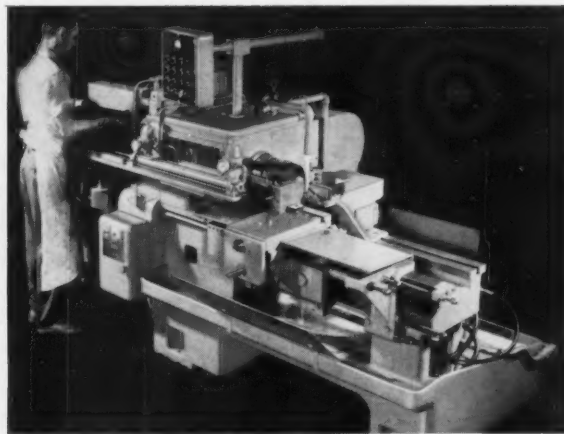
Facing and Chamfering Both Ends of 240 Stator Shells Per Hour

Facing and chamfering both ends of stator shells is done by automation of this Model 6A Automatic Lathe. A finger picks a part from the inclined loading chute and positions it for spindle loading. The part is machined on both ends simultaneously and then ejected into the unloading chute.



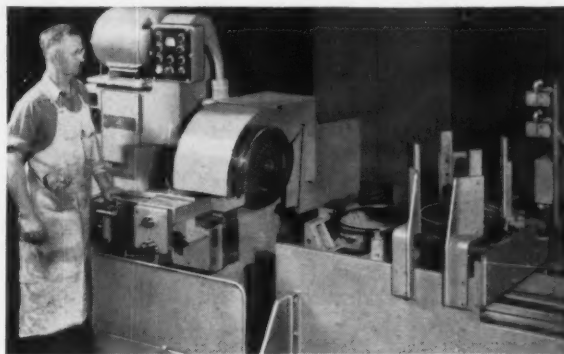
Turning Diesel Engine Pistons

Several different models and sizes of diesel engine pistons are turned by automation of a Sundstrand Model 8A Lathe. The part is released from the loading chute, pushed on the driver, turned, grooved and faced, then pulled off the driver and released into the unloading chute.



Hopper Loading Through Spindle

This example, a steering actuator screw, lends itself to a different type of automation. Here the work, coming from a gravity feed hopper is pushed through the spindle at the back to a positive stop and clamped for turning and grooving the end. After the cut, the part is automatically released and pushed into the unloading chute by another incoming part. Production is 240 pieces per hour.



Turning 165 Ring Gears Per Hour

Here, automation is provided for loading and ejection of fly-wheel ring gears. The shuttle loader picks up a part from the magazine, moves forward, swings up 90° to place part into the clamps and returns for another part during the cutting cycle. After the cut, the clamps release allowing the part to roll down the unloading chute.

Free Data

Additional information is available on the complete line of Sundstrand Automatic Lathes for small lot, long run or special turning jobs. Ask for bulletin 658.



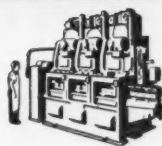
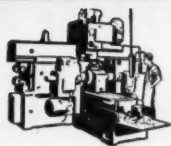
BOOTH

1412



TRIPLEX RIGIDMILS

SPECIAL MACHINES



SUNDSTRAND Machine Tool Co.

2530 Eleventh St. • Rockford, Ill., U.S.A.



at the Machine Tool Show...Booth 1221

SEE THE GREENLEE SIX-SPINDLE BAR

AIR-FEED AUTOMATIC

OPERATING WITH

Air-Feed Stock Reel . . .
Lead Screw Threading . . .
Thread Rolling . . .
and a complement of standard
tooling attachments.



Here are some typical examples of work done on this machine. Pieces up to 24" can be handled easily . . . at fast speeds.

The air-feed machine can
be modified to handle
long parts as shown at left.



GREENLEE BROS. & CO.
1868 Mason Ave.
Rockford, Illinois

WRITE FOR
COMPLETE INFORMATION



Machinery, August, 1955

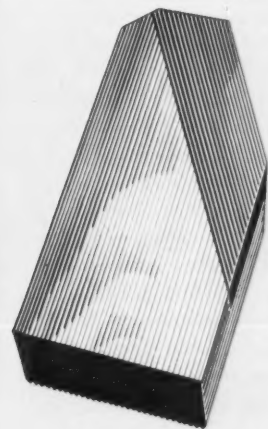
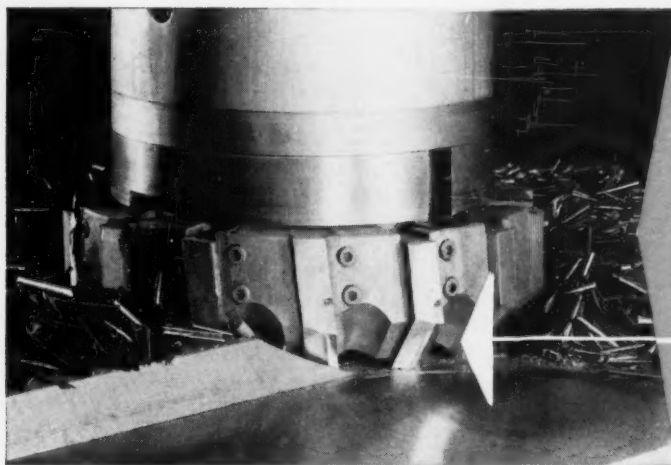
CENTER OF MACHINE-TOOL EXCELLENCE

ROCKFORD, ILLINOIS, U.S.A.

INGERSOLL

Replacement Blades...

MAKE THE *BIG* DIFFERENCE IN METAL CUTTING



Don't overlook the hardest working members of any metal cutting team — the replacement blades. Ingersoll blades are the BIG reason why so many shops are getting outstanding returns on sizeable investments in cutting tools and milling machines.

Specially designed to give longer cutting life, these replacement blades offer selected grades of carbide for your particular work. Ingersoll, the largest manufacturer of inserted blade cutters and replacement blades, has carbide-tipped, cast alloy or high speed steel blades available from stock for most standard Ingersoll cutters.



WRITE FOR CUTTER CATALOG 66B, describing Ingersoll inserted blade face mills, end mills, helical slab mills, side mills, arbor cutters and boring heads.



THE **INGERSOLL**

MILLING MACHINE COMPANY
ROCKFORD, ILLINOIS, U.S.A.

BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES
ORIGINATORS OF *SHEAR CLEAR* CUTTERS

Machinery, August, 1955

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**



see *Hendey*
for improved accuracy and speed...

The Hendey 9" Tool and Gage — Maker's Lathe provides maximum precision and versatility for toolroom and production use. Some of its features include 24" center distance and 10-1/4" swing, sixty-six thread and feed changes, and an independent lead screw.

This Hendey lathe has a new magnetic amplifier drive unit for speeds which are infinitely variable and which can be changed smoothly and easily while under load. This type of drive is very simple and requires a minimum of maintenance. Spindle speeds range from 15 RPM to 3000 RPM. Speeds from 15 RPM to 250 RPM are available through back gears. Start — stop, forward — reverse, and spindle speed selection are easily controlled. This machine can also be furnished with an electronic drive unit.

9" tool and gage-maker's lathe



highly adaptable and sensitive



See them in action in Booth No. 221

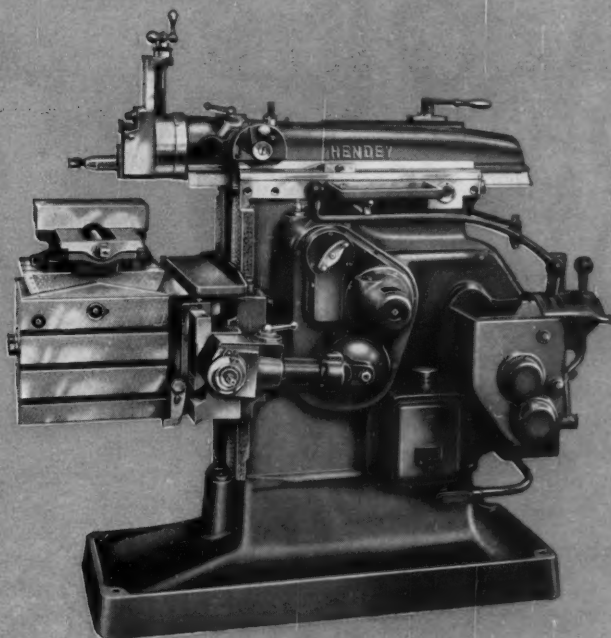


Machinery, August, 1955

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

greater flexibility in tool room work

12" crank shaper



The Hendey 12" Crank Shaper is a high-speed universal machine designed for maximum flexibility in a wide variety of cuts. It is constructed especially for precision work, and speeds up to 200 strokes per minute are available. The vise and table are the finest available on any shaper, allowing the work to be positioned to any desired angle. The universal table will rotate 360° about its axis. The tilting top can be set to 15° on either side of the horizontal position. This machine is also available in 16" and 20" sizes. In addition to the vise and table, standard equipment includes dual mechanical controls, automatic lubrication, power down feed, quick-change swivel head, pre-loaded Timken bearings on the crank gear, and helical teeth on the crank gear and back gear.

for precision work at high speed

Hendey machine division
BARBER-COLMAN COMPANY
115 LOOMIS ST., ROCKFORD, ILLINOIS



Machinery, August, 1955

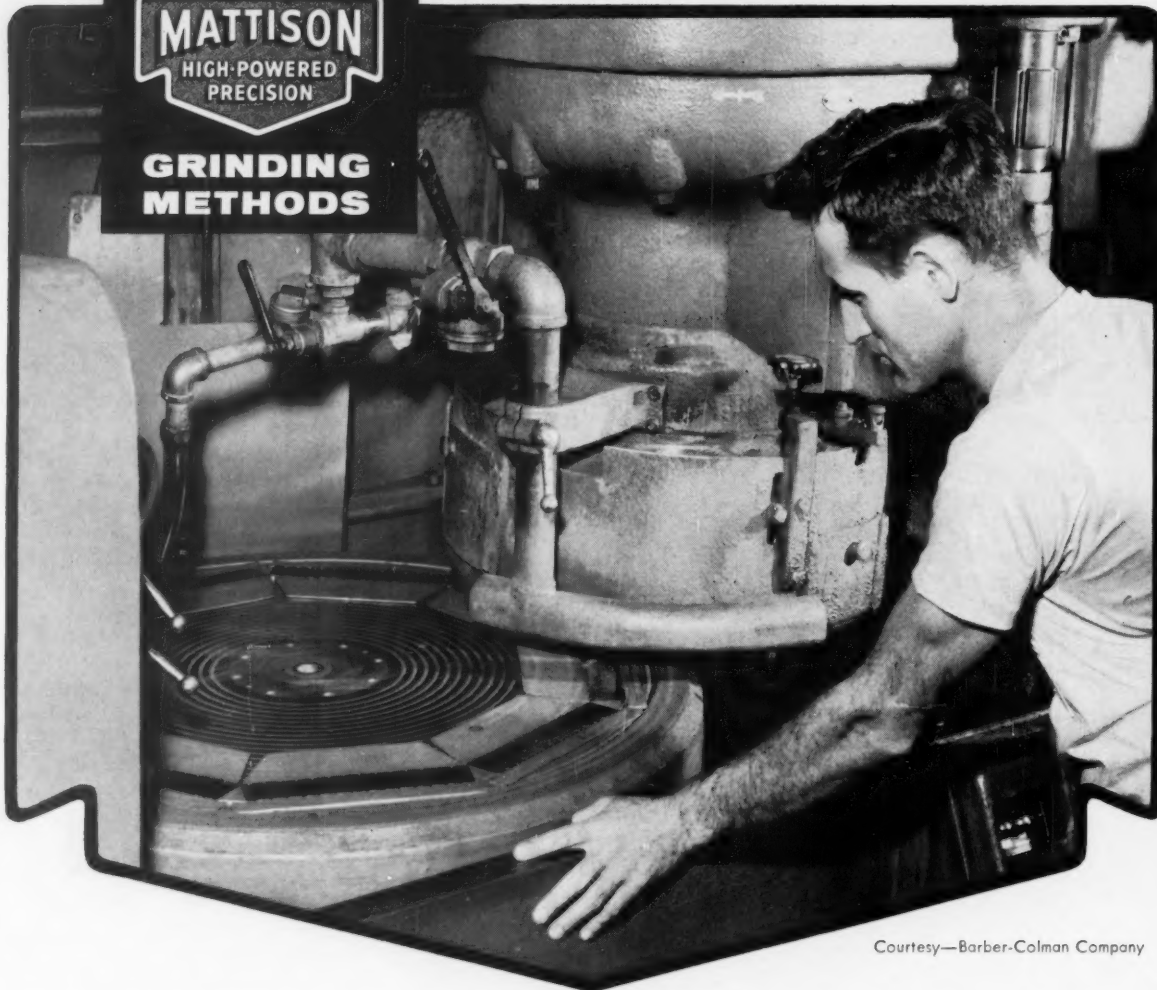
FOR PRODUCTION MACHINE TOOLS IT'S

ROCKFORD, ILLINOIS, U.S.A.



MATTISON
HIGH-POWERED
PRECISION

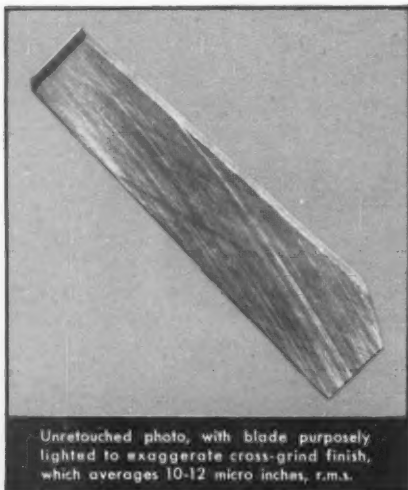
**GRINDING
METHODS**



Courtesy—Barber-Colman Company

Grinds 262 reamer blades per load

... holds size and flatness within .0003"



Unretouched photo, with blade purposely lighted to exaggerate cross-grind finish, which averages 10-12 micro inches, r.m.s.

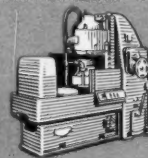
For over ten years the Mattison No. 36 Vertical Rotary Surface Grinder has finish ground these hardened reamer blades without loss of accuracy.

On the job shown, for example, 262 blades are ground per load on both sides, holding size and flatness within .0003"—easily under the .0005" limit. Blades are M-3 (Type 1) high-speed steel. Spindle is set at 90° to the chuck. User reports exceptional cross-grind finish (averaging between 10 and 12 micro inches, r.m.s.) using a 60 grit segmental wheel.

The reason Mattison Grinders give

you greater accuracy *longer* is quite simple. The extra-heavy and extra-wide vertical column is *one* solid piece, bolted to the end of the base. "V" and flat column ways are longer, wider, and thicker. This prevents the wheel head slide from binding and "cramping," and permits the machine to feed accurately in increments as fine as .0001". The wheel head adjustment is close to the spindle, too, which simplifies "tilting" and promotes accurate grinding on a wider variety of work. Write for Bulletins 144 and 146 describing the numbers 24 and 36 Vertical Surface Grinders.

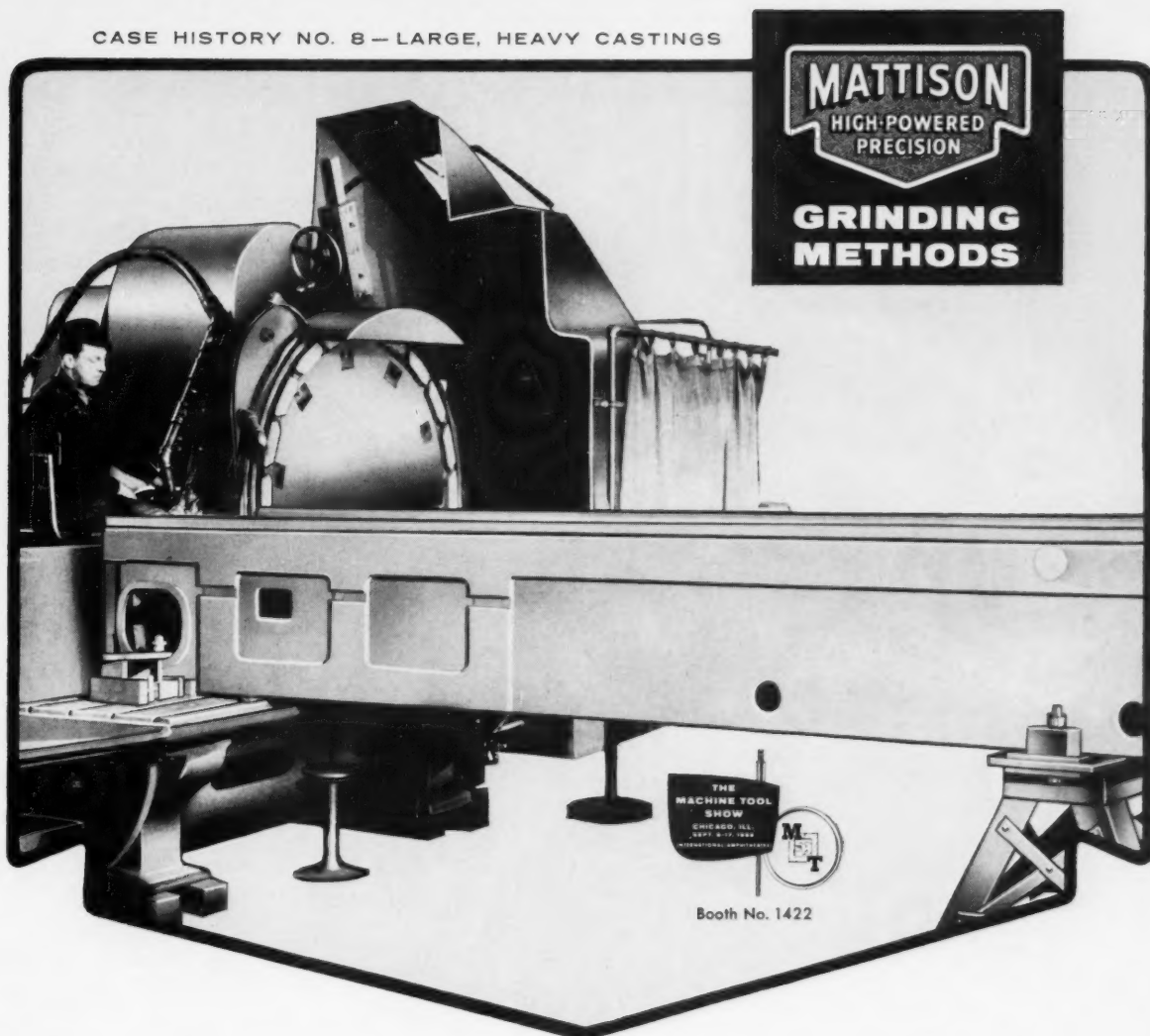
**IF IT'S A FLAT SURFACE
THERE IS A MATTISON
TO GRIND IT**



Machinery, August, 1955

MACHINES DESIGNED TO MEET YOUR NEEDS

ROCKFORD, ILLINOIS, U.S.A.



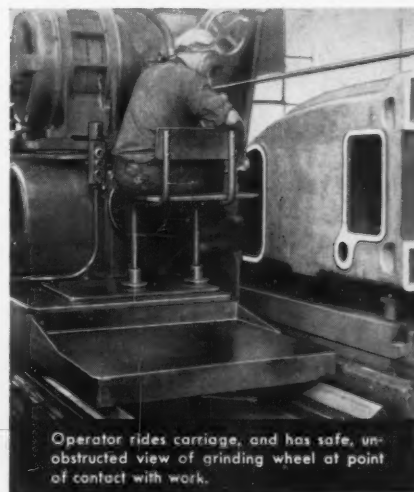
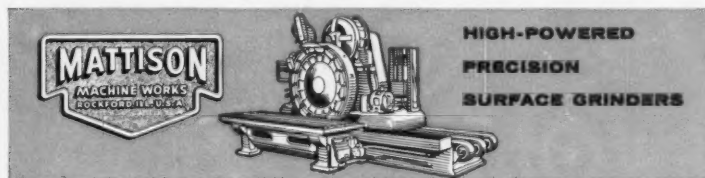
How to face grind long or large parts with surprising speed and accuracy!

Ends of these 35 ft. base castings are quickly ground to close tolerances on the Mattison "UK" Traveling Wheel Face Grinder.

One end of the work is supported by the stationary work table and the other by supplemental blocking. The grinding wheel head . . . mounted on a slide having long, wide ways . . . can be fed by hand or automatically in steps of .0005" to .003", and travels on the carriage across the surface to be finished. Amount of floor space needed is little

more than *half* that required by traveling table machines of equal capacity. The operator's position on the carriage, together with the convenient grouping of controls, permits fast, accurate production regardless of the size of the job!

If you want to machine the ends of long pieces, such as bed castings, structural steel beams, rails, and steel plates, the Mattison "UK" Traveling Wheel Face Grinder will do the job better, faster, at lower overall cost. Write for Bulletin 844-2.



Operator rides carriage, and has safe, unobstructed view of grinding wheel at point of contact with work.





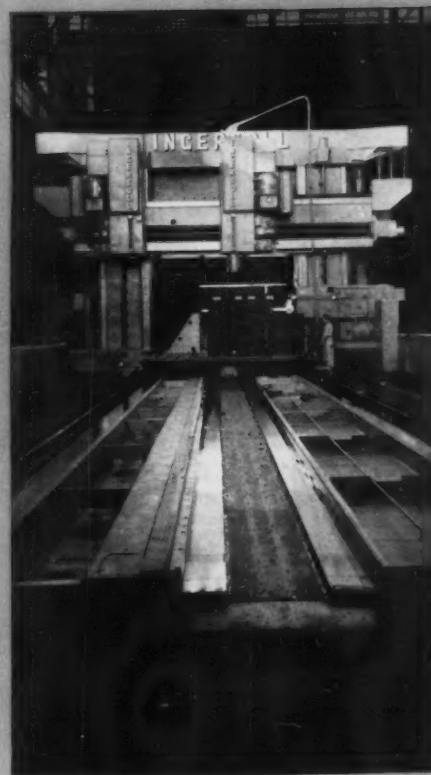
Invitation to visit **INGERSOLL**

No Ingersoll machines will be displayed at the Machine Tool Show in September. During September, however, we will be testing eight large machines on our assembly floors—including four adjustable rail milling machines ranging in horsepower from 30 to 100. Our customers will use them for machining refrigeration compressor parts, automobile body dies, and machine tool frames.

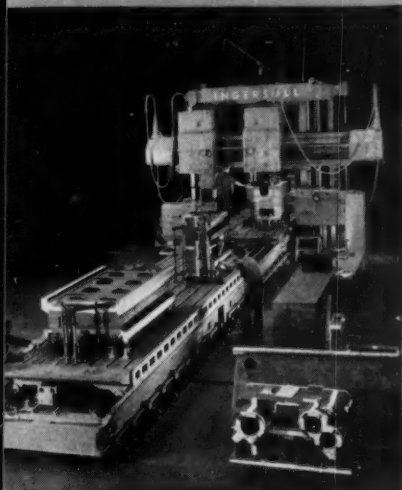
We will also be testing a 9-station process machine for the first operations on an automobile cylinder block; a special single station machine for tractor frames; a special vertical spindle milling machine for small die work; and a large 7" bar traveling housing milling and boring machine for machining rolling mill parts.

The sketches at the left represent four of these new machines. If you would like to see any particular one, our representative will be glad to assist you in getting to Rockford when it is running.

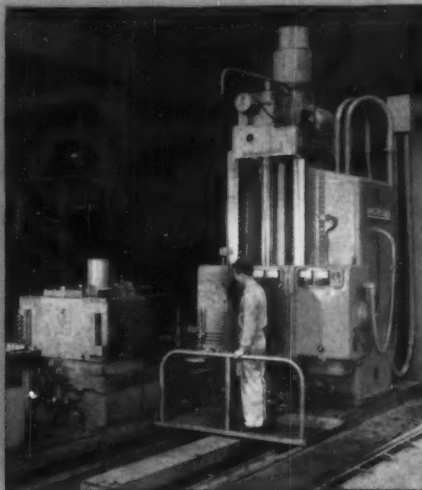
Our own machine shop will be working day and night during September on parts for machines we will ship during November and December. The photos at the right show four recent additions to our heavy milling department. We would like to have you see these machines under production conditions.



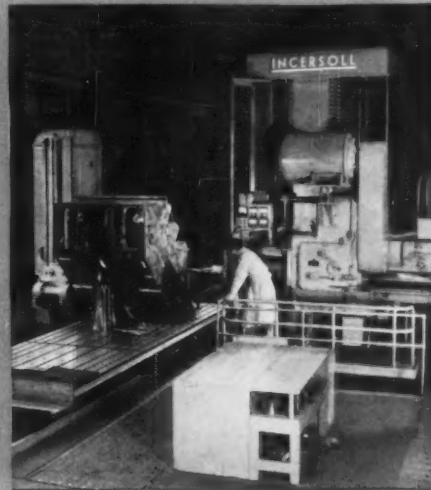
A 1,150,000 pound Ingersoll Adjustable Rail Milling Machine with 850 total connected horsepower—the largest milling machine in the world.



The latest design Ingersoll Adjustable Rail Milling Machine for medium size work—capable of delivering 100 H.P. to any spindle.



An Ingersoll Special Design Horizontal Spindle Milling Machine with two indexing work tables—one equipped with magnetic fixtures.



An Ingersoll 8" Bar Openside Machine specially designed for heavy milling and accurate boring on our own machine parts.

RSOLL

INGERSOLL MILLING MACHINE COMPANY ROCKFORD, ILL.

Machinery, August, 1955



SPECIAL MULTI-OPERATION MACHINE TOOLS
NEEDLE BEARING ASSEMBLY MACHINES • INDEX TABLES
SELF-CONTAINED DRILL UNITS • SELF-CONTAINED TAP UNITS



When you are in ROCKFORD
be sure to visit this plant...

We would like to have you stop in and see us. We would like to have you meet the people who conceive, design, engineer, and manufacture REHNBERG-JACOBSON Special Machines and other products. We would like you to see the up-to-date facilities that are at our command to accomplish your purposes. The REHNBERG-JACOBSON plant is an interesting one because it does not follow the conventional pattern — just as REHNBERG-JACOBSON products are often outstanding in performance because they

employ ingenious new conceptions and new arrangements. You are welcome to visit any part of the REHNBERG-JACOBSON shop or offices that may interest you, and to talk with any of our people. One of our sales personnel or executives will be glad to guide you around. As a user of machine tools and allied products, you might like to know what facilities REHNBERG-JACOBSON has for satisfying your needs — and we want you to feel free to stop in and visit us the next time you are in ROCKFORD.



REHNBERG - JACOBSON
MANUFACTURING COMPANY
Designers and Builders of Special Machinery
2135 KISHWAUKEE ST., ROCKFORD, ILL.



Machinery, August, 1955

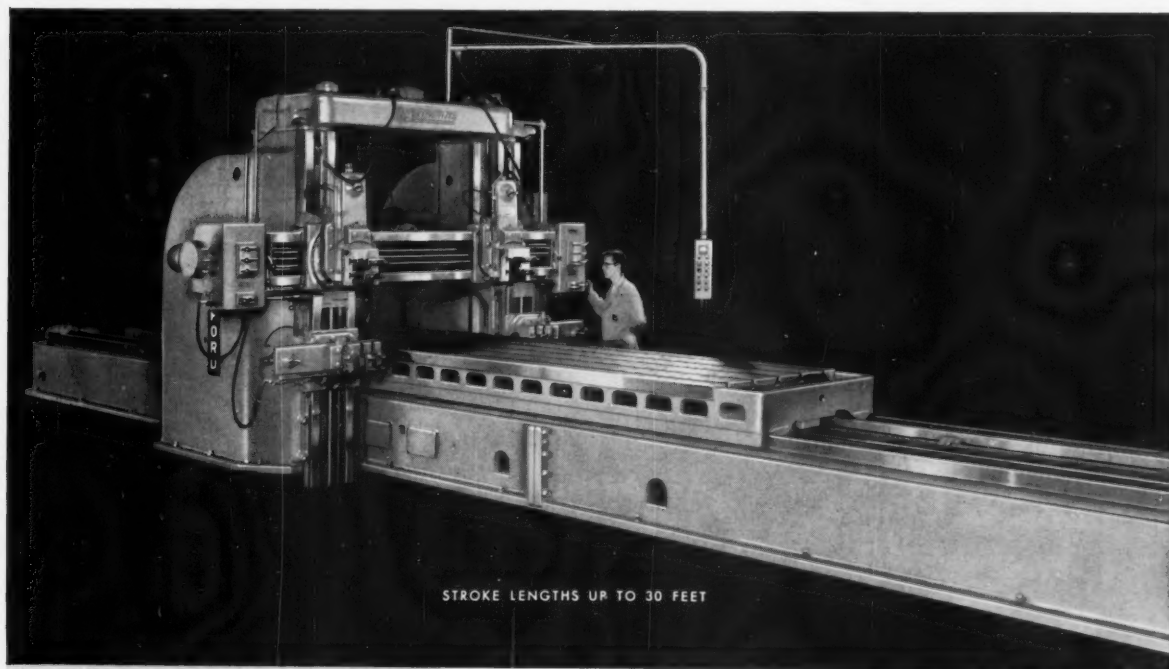
HYDRAULIC

fast, economical production calls for

HYDRAULIC

hydraulic planers with exclusive triple circuit

HYDRAULIC



STROKE LENGTHS UP TO 30 FEET

Hy-Draulic

Hydraulic Drive is a natural for reciprocating-type machine tools. It provides smooth, powerful cutting, fewer moving parts, and longer useful life.

Hydraulic Planers have the new Triple Circuit which provides easy selection of the correct combination of cutting speed and force to most economically machine every type of material — free-cutting materials to the toughest steels.

When you modernize your production facilities plan on Hydraulic Shapers, Planers and Slotters to provide the fastest, most economical production methods.

ROCKFORD MACHINE TOOL CO.

2500 Kishwaukee Street

• Rockford, Illinois

Machinery, August, 1955

CITY OF MACHINE-TOOL SPECIALISTS

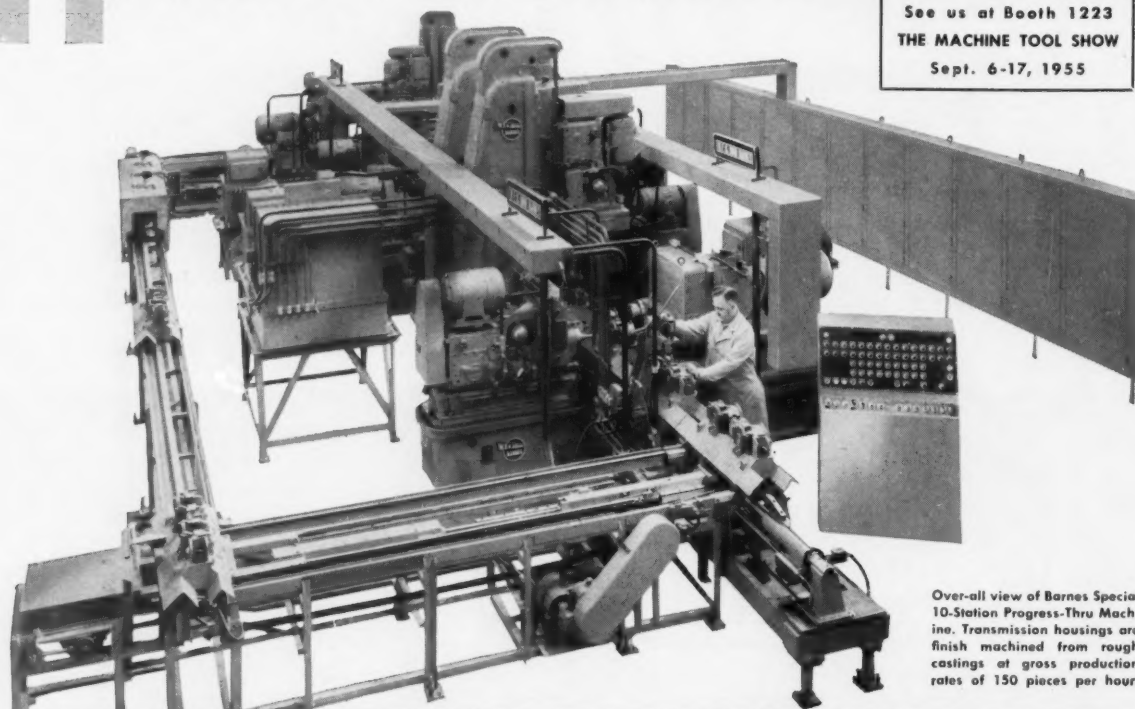
ROCKFORD, ILLINOIS, U. S. A.



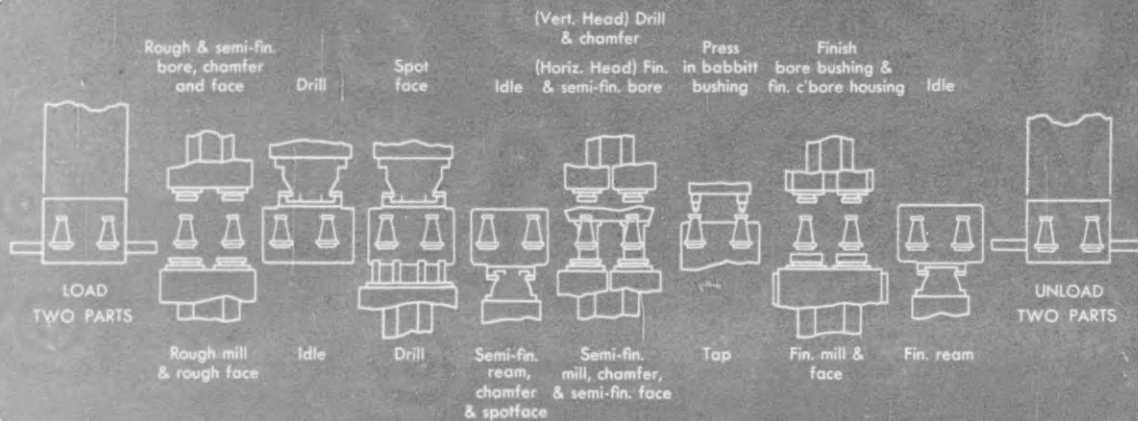
TRANSMISSION EXTENSION

HOUSINGS NOW MACHINED COMPLETE

See us at Booth 1223
THE MACHINE TOOL SHOW
Sept. 6-17, 1955

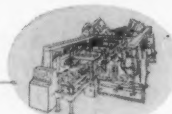
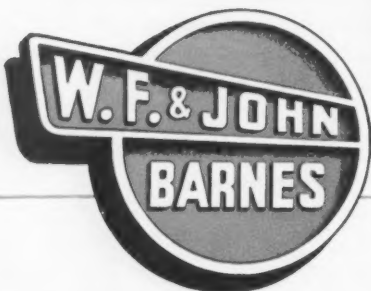


Over-all view of Barnes Special 10-Station Progress-Thru Machine. Transmission housings are finish machined from rough castings at gross production rates of 150 pieces per hour.



▲ Schematic drawing of machining operations. Total concentricity on all operations does not exceed .002". Housings are held in transfer plates which are located by two hydraulically actuated dowels and clamped hydraulically at each machining station.

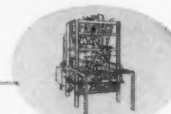
*Builders of
Better Machines
Since 1872*



Special Machine Tools



Special Conveyor Units



Special Process Equipment

MULTIPLE SPINDLE DRILLING • BORING • TAPPING MACHINES

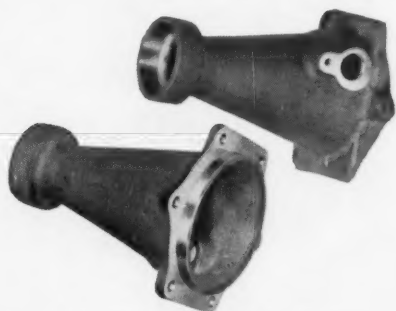


Machinery, August, 1955

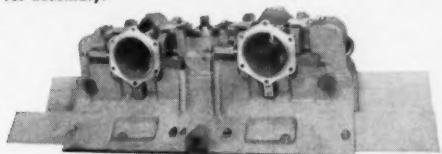
CENTER OF MACHINE-TOOL EXCELLENCE

ROCKFORD, ILLINOIS, U.S.A.

FROM ROUGH CASTING TO FINISHED PART



Transmission extension housings are finish machined in automatic cycle from rough casting to finished workpiece. After rapid washing and final inspection, the part is ready for assembly.

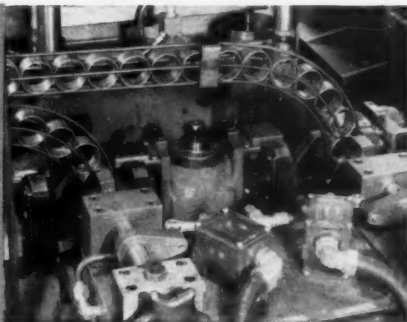


View of workpieces in special transfer plate fixture. Both housings are located and accurately positioned by means of dowels and screw-operated V-block clamps.

ON W. F. & JOHN BARNES SPECIAL 10-STATION PROGRESS-THRU MACHINE

Here is another typical example of how W. F. & John Barnes Six-Point Machine Tool Building Service has helped increase production efficiency for a leading automobile manufacturer. All machining operations on transmission extension housings are now combined in one Special Barnes 10-Station Progress-Thru Machine at a production rate of 150 pieces per hour. Two operators, one at the loading end and the second at the unloading end, load and unload housings on transfer plates which carry workpieces through the entire machining cycle. Operations include boring, facing, milling, drilling, reaming, automatic press-in of babbitt bushings, and combination finish bore babbitt bushing and finish counterbore housing.

Whether your production requires large or small machines, you'll find the coordinated services at Barnes can help you solve problems quickly and efficiently.



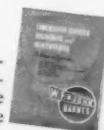
Closeup of station seven where babbitt bushings are automatically pressed-in to the small end of the housings. Bushings are hopper loaded by operator at the unloading station.

BARNES' COORDINATED 6-POINT MACHINE TOOL BUILDING SERVICE INCLUDES:

- 1 **SPECIALIZED MANUFACTURING FACILITIES** — 75-year background, large well equipped plant efficiently tooled to build high production machines.
- 2 **SPECIAL HYDRAULIC EQUIPMENT** — designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.
- 3 **SPECIAL ELECTRICAL EQUIPMENT and CONTROLS** — individually designed and built for maximum safety and ease of control, with circuits that assure the most dependable coordination of all machine functions.
- 4 **SPECIAL GAUGES, FIXTURES, TOOLS** — designed for each individual machining problem, assure accuracy of operations at high production speeds.
- 5 **SPECIAL HANDLING AND CONVEYOR EQUIPMENT** — designed and built to reduce work handling, effect maximum safety and efficiency.
- 6 **COORDINATED DESIGN AND ENGINEERING** — Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.

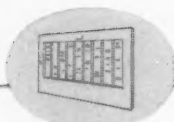
WRITE FOR
FREE BOOKLET

Ask for free booklet "Coordinated Machine Engineering" describing the scope of Barnes machine tool building service.

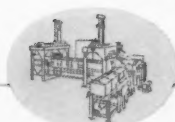


W. F. & JOHN BARNES COMPANY MACHINE TOOL DIVISION

402 SOUTH WATER STREET, ROCKFORD, ILLINOIS



Special
Electrical Controls



Food
Machinery

AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

Machinery, August, 1955

CITY OF MACHINE-TOOL SPECIALISTS

ROCKFORD, ILLINOIS, U.S.A.



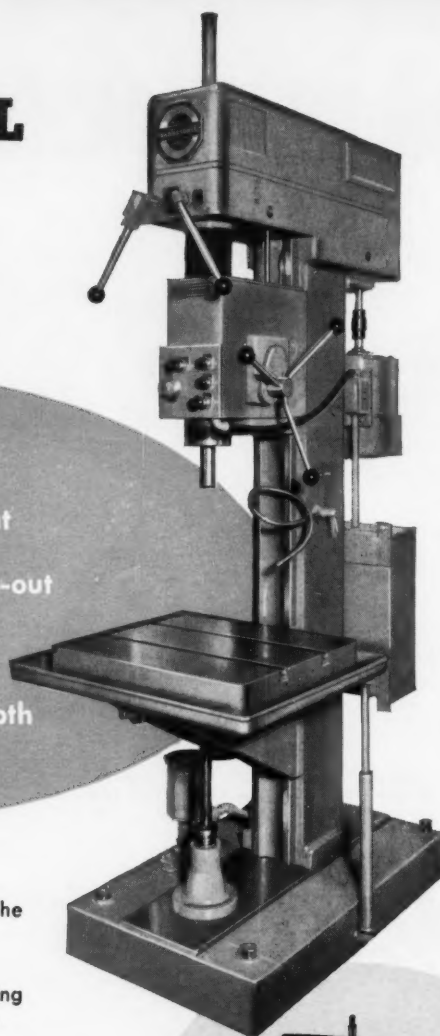
7/8

new **BARNESDRIL**

high speed
drilling machine

- 7/8" capacity in steel
- Push button feed engagement
- Depth control with automatic feed trip-out
- Electric starting control
- Direct reading dial for selecting depth

This new high speed drilling machine is production designed and priced to offer the highest quality features available on this class of drilling machine. The machine provides speeds up to 4500 RPM, depending on the motor and drive ratio used. Motor is optional in either 1200 or 1800 RPM. Feeds are provided up to .012" per revolution of the spindle.



on display at booth no. 818

AVAILABLE IN 4 MODELS

7/8 S

Special Purpose, Single Speed
—2 speeds by adding back gears.

7/8 T

Toolroom—4-Speed Motor with V-Belt Drive
—8 speeds by adding back gears.

7/8 G

Semi-General Purpose—4-Speed with Step Sheave for V-Belt Drive.
—8 speeds by adding back gears.

7/8 U

General Purpose—4-Speed Geared Transmission
—8 speeds by adding back gears.



BARNES DRILL CO.

820 CHESTNUT STREET • ROCKFORD, ILLINOIS
DETROIT OFFICE: 3419 SOUTH TELEGRAPH ROAD

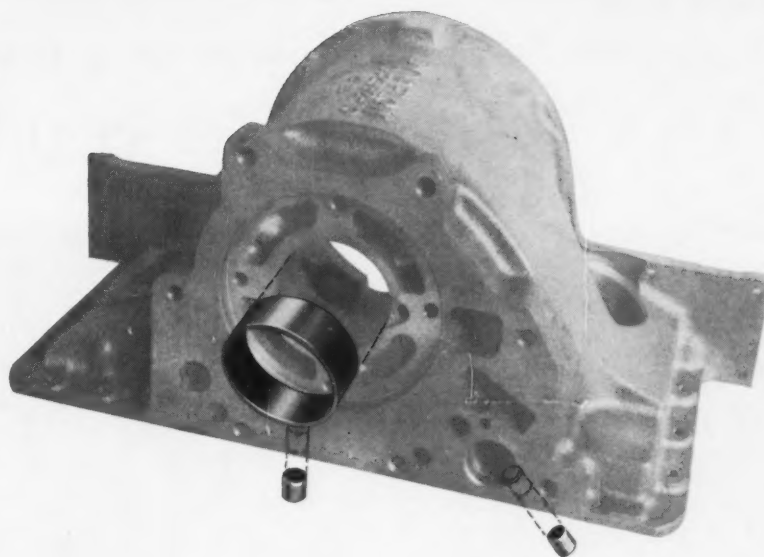


Machinery, August, 1955

CENTER OF MACHINE-TOOL EXCELLENCE

ROCKFORD, ILLINOIS, U.S.A.

ANOTHER
American
FIRST



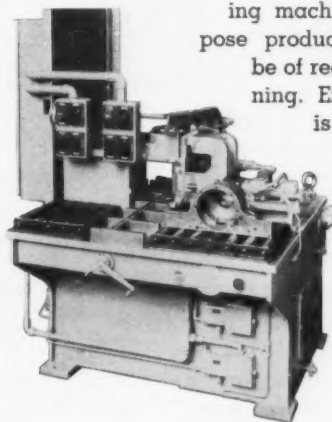
3 parts assembled from 3 different angles IN ONE AUTOMATIC MACHINE OPERATION



Parts magazines (indicated by arrows) are manually loaded with bushing and plug parts. Transmission case from right hand conveyor is turned 90° and pushed into position by operator. Push button starts machine cycle, case is automatically clamped, and bushing and two plugs are pressed into case simultaneously by hydraulic cylinders. As case is automatically unclamped, operator places it on outgoing conveyor.

Designed for an automotive conveyor-type assembly line this American Hydraulic Press inserts a bushing and two dowel plugs in an automotive transmission case — all three parts from different angles — in a single, push-button controlled, automatic cycle. It is a typical result of the service that American offers for designing and building automatic assembling and broaching equipment.

American's experience in developing machines for special purpose production operations can be of real value to your planning. Engineering versatility is a proven American asset.



A letter or 'phone call outlining your requirements will be welcomed—and will produce prompt cooperation.



American BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



Machinery, August, 1955

FOR PRODUCTION MACHINE TOOLS IT'S **ROCKFORD, ILLINOIS, U.S.A.**



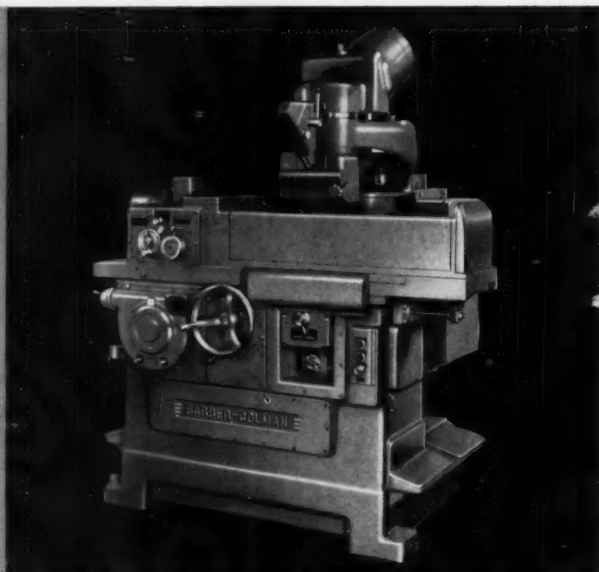
keep tool maintenance on a production basis with

automatic

NEW no. 6-5 sharpening machine

A PRODUCTION MACHINE FOR PRECISION SHARPENING

- wet grinding for carbides
- adjustable stroke and table speed
- precision built-in wheel dresser
- automatic feed and index counting



The new No. 6-5 Hydraulic Sharpening Machine provides a production method for precision sharpening of hobs and form — relieved cutters. This is a precision machine which accurately controls spacing, rake angle, lead of flute and surface finish.

Wet grinding, which is provided as standard equipment on the No. 6-5, is essential for grinding carbide — tipped tools and also permits greater feed when sharpening high-speed steel tools. Setting up new jobs for completely automatic sharpening is accomplished rapidly and conveniently. The adjustable table stroke and variable table speed also contribute to the production efficiency of this machine.

For a demonstration of how to keep cutting tool maintenance on a production basis, see this machine in operation at the Machine Tool Show.



Visit us in Booth No. 1322

Barber-Colman Sharpening Adaptable to All Hobs and Form-Relieved Cutters

Sharpening is one element of hob accuracy which must be maintained in order to cut correct gears. For high production sharpening or for small, job-lot sharpening, the most economical and most accurate method of sharpening hobs and form-relieved cutters is the Barber-Colman method. In addition to the No. 6-5, two other sharpening machines, the No. 4-4 and the No. 10-12, are built to cover a complete size range of work. Any hob or form-relieved cutter can be sharpened on one of these machines.

B U I L D E R S O F P R E C I S I O N G E A R

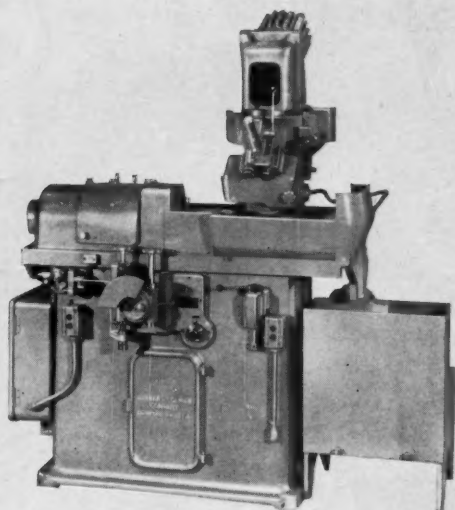


Machinery, August, 1955

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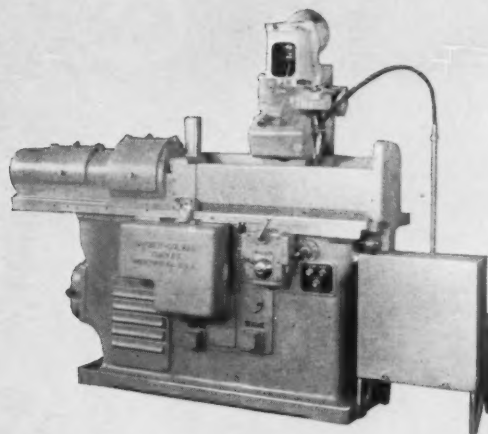
ROCKFORD, ILLINOIS, U.S.A.

hob sharpening



No. 4-4 Sharpening Machine

This is an automatic sharpening machine with fixed stroke, and built-in wheel dresser for work up to 4" diameter and 4" long. Wet grinding (shown) is optional as extra equipment. Positive mechanical control over all sharpening factors automatically produces uniformity and reduces sharpening time. Spacing, lead of flute and radialism are held within tolerances for any accuracy classification, including Class AA.



No. 10-12 Sharpening Machine

This is an automatic sharpening machine with adjustable hydraulic stroke for work up to 10" diameter by 12" long. Wet grinding (shown) is optional as extra equipment and the machine has a precision built-in wheel dresser as standard equipment. Tolerances are easily held for any specific class of accuracy. Once the necessary set-up is made, sharpening proceeds automatically without further attention from the operator.

All Barber-Colman hobs and form-relieved cutters are sharpened on one of these three machines. Because of their accuracy and ease of operation, most competitive hob manufacturers also use them for sharpening hobs.

A Barber-Colman Sharpening Machine will do your sharpening cheaper, faster and more accurately than can be done by any other method. Come in and see us during the Machine Tool Show to determine how you can simplify your sharpening problems by adopting this modern precision method.

**HOBBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES**



Barber-Colman Company

GENERAL OFFICES AND PLANT, 628 ROCK STREET, ROCKFORD, ILL.

H O B S A N D M A C H I N E S S I N C E 1 9 1 1

Machinery, August, 1955

CITY OF MACHINE-TOOL SPECIALISTS ROCKFORD, ILLINOIS, U.S.A.



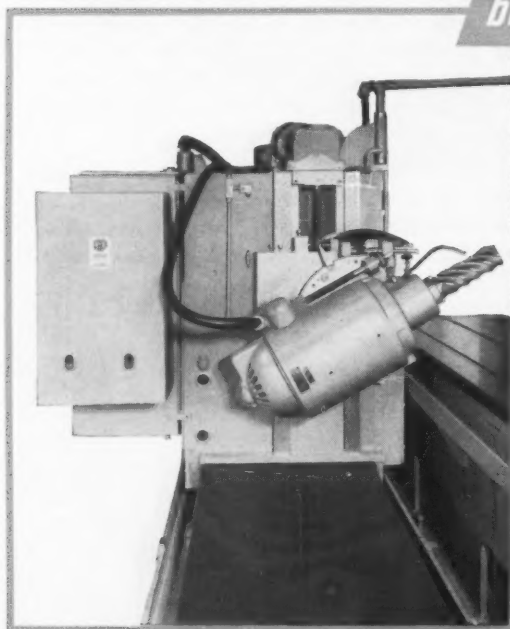


POWERFUL and VERSATILE!

**SCARF AND EDGE
MILLING MACHINE**



by EKSTROM, CARLSON



Modern manufacturing methods can be well-served by this new open side milling machine with its wide range of adjustments and great metal-removing capacity. It is particularly well adapted to the milling of spars and other aircraft parts, and to the scarfing of solid wing panels commonly used in current aircraft construction. An indication of the machine's potential power is the fact that the cutter spindle (which can be tilted 30° upward or downward) is driven by a 30 h.p. motor. The work table is 12 feet long and the feed rate can be varied between 10" and 200" per minute. Write for further particulars.

EKSTROM, CARLSON & CO.
Dept. M-4, 1400 Railroad Ave.
Rockford, Illinois

FOR GREATER AIRCRAFT PRODUCTION!



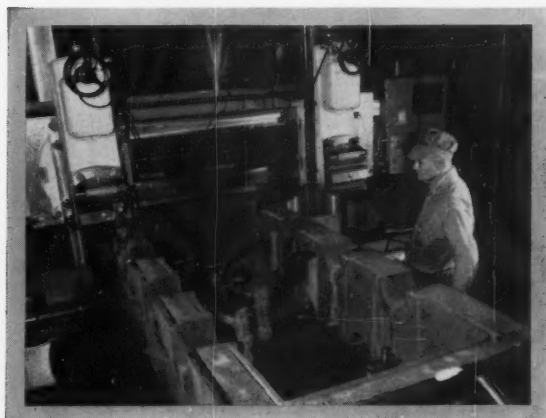
Machinery, August, 1955

MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**



Morgan Engineering Co. now gets full efficiency from high-speed planer as...

Carboloy Grade 370 carbide cuts production time 50% on steel-cutting "problem" job



Here's still more proof that there are no known "equivalent grades" for Carboloy® Series 300 carbides for medium- and heavy-duty steel-cutting:

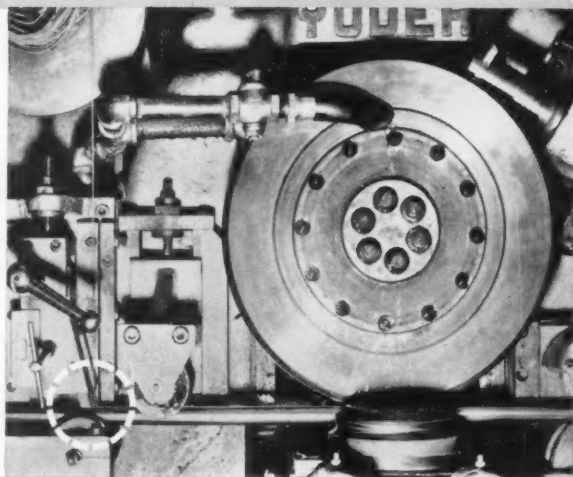
PLANING CAST STEEL GEAR CASE. Long planer cuts on this 1-ton cast steel gear case cause thermal cracking in any carbide. Former tools had to be "babied along" to prevent excessive downtime for tool changes. Switching to Carboloy Grade 370, Morgan Engineering Co. now runs their high-speed planer four times faster... removing nearly 2000 cubic inches of metal before regrinding to eliminate thermal cracks. Production and tool life are doubled; machine efficiency is up 15%.

SETUP: Material—1-ton cast steel forging. **Speed**—160-180 SFPM. **Feed**—0.040-0.080 inch. **Depth of cut**— $\frac{5}{16}$ - $\frac{1}{2}$ inch. **Coolant**—No.

Carboloy Grades 350 and 370 increase machine output, lower tool costs. Here's the complete story...

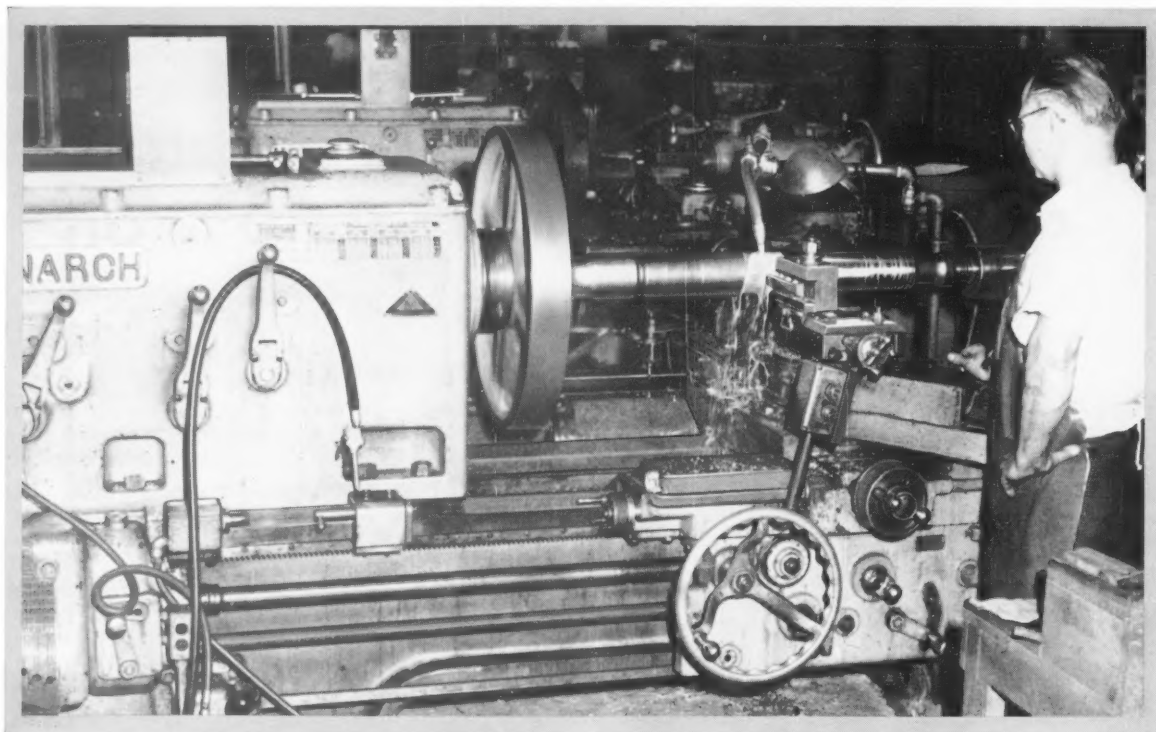
FLASH TRIMMING steel tubing at 2400°F ruined tools quickly at Bissell Carpet Sweeper Co., Grand Rapids, Mich. Switching to a standard Grade 370 tool eliminated costly special carbide tool; boosted production 14%. Line now operates full day without tool change.

SETUP: Material—cold-rolled steel. Speed—50-60 SFPM. Coolant—No.



Case histories prove there are no known "equivalent grades"—

Carboloy 350 and 370 outperform

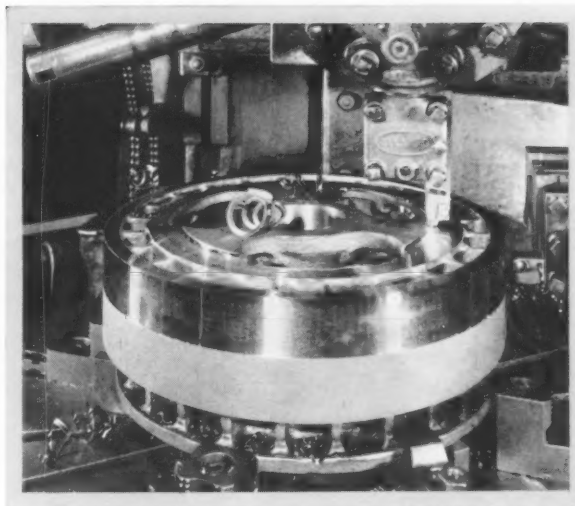


TURNING landing-gear piston with Grade 350 saved Menasco Mfg. Co., Burbank, Calif., ½ hour per shift in downtime. Other carbides produced 2 parts per grind at 125 SFPM; Grade 350 cuts at 185 SFPM with 6 times the production per grind.

SETUP: Material—4340 heat-treated forged steel. Speed—185 SFPM. Feed—0.010 inch. Depth of cut—0.060-0.200 inch. Coolant—Yes.

FACING power shovel clutch and brake drum assembly with Grade 370 inserts cut over-all machining costs almost 70% for a Chicago mining machine manufacturer. Two Grade 370 clamp-on blanks replaced 16 tools.

SETUP: Material—1045 low carbon, high manganese cast steel, with hardness of 27 R_c. **Speed**—24 RPM. **Feed**—0.018-0.033 inch. **Depth of cut**— $\frac{3}{8}$ inch. **Coolant**—No.



all other steel-cutting carbides

**Boost production as much as 366%;
reduce downtime losses, tool costs**

Hundreds of metalworking plants are now using Carboloy Grades 350 and 370 on their toughest steel-cutting jobs. And from plant after plant come reports of:

Reduced production time because Carboloy Series 300 carbides maintain efficiency at faster speeds, greater feeds, deeper cuts.

Reduced downtime because these new grades can take the punishment of high-speed machining . . . and stay on the job.

Reduced tool costs because Grades 350 and 370 take more regrinds; often eliminate rough finishing operations and tools.

Increased machine efficiency because Series 300 carbides have the strength and versatility to let you operate machines at upper performance limits.

The new, carefully controlled Carboloy process used in producing Series 300 imparts built-in structural rigidity *at the cutting edge*. Both Grade 350 and 370 can operate efficiently around 1800°F . . . a range where the cutting edges of other carbides deform, greatly reducing their effectiveness.

Your Authorized Carboloy Distributor can give you immediate delivery on Carboloy standard tools, inserts, and blanks in Grades 350 and 370 . . . in a wide range of sizes and styles. For the new Series 300 price list GT-305, send coupon on the next page, today.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

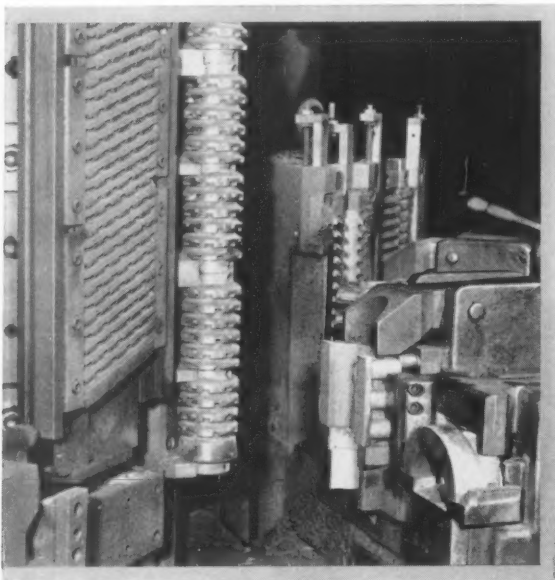
OVER→

Carboloy Created-Metals for Industrial Progress

MACHINERY, August, 1955—91

If you're machining cast iron,
nonferrous metals, or plastics . . .

There's a Carboloy grade to fit your needs



BROACHING automobile bearing caps with Carboloy Grade 883 brought Studebaker a 22% saving in over-all costs. Carbide on previously used broach lasted a maximum of 24 hours; Grade 883 ran 50 days.

SETUP: Material—highly abrasive cast iron. Speed—28 SFPM. Chip load per tooth—0.005 inch for roughing; 0.0015 inch for finishing.

Carboloy tools, blanks, and inserts are available in many standard grades for machining cast iron, nonferrous materials, and plastics — as well as steel.

These grades are stocked in a wide range of sizes and styles by your Authorized Carboloy Distributor. He'll provide immediate local delivery to help you keep inventory costs down.

And your Distributor can give you expert assistance with any machining problem you may have . . . recommending the correct carbide grade and tooling method that best suits your particular job.

Send coupon, today, for price lists and specifications on Carboloy grades.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

MANUFACTURERS OF CEMENTED CARBIDES, PERMANENT MAGNETS, THERMISTORS, HEVIMET, AND VACUUM-MELTED METALS

CARBOLOY

Department of General Electric Company

11147 E. 8 Mile Street, Detroit 32, Michigan

- ☐ Please send price list and specifications on steel-cutting Grades 350 and 370.
- ☐ Please send price list and specifications on other standard grades.

Name _____ Title _____

Company _____

Address _____

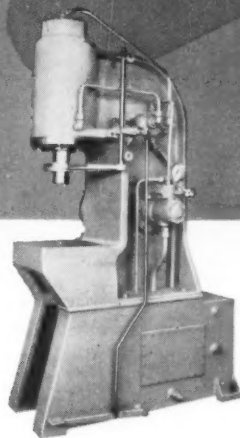
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Carboloy has big news for the metalworking industry

Don't miss the Carboloy show booths
Chicago — September 6-16

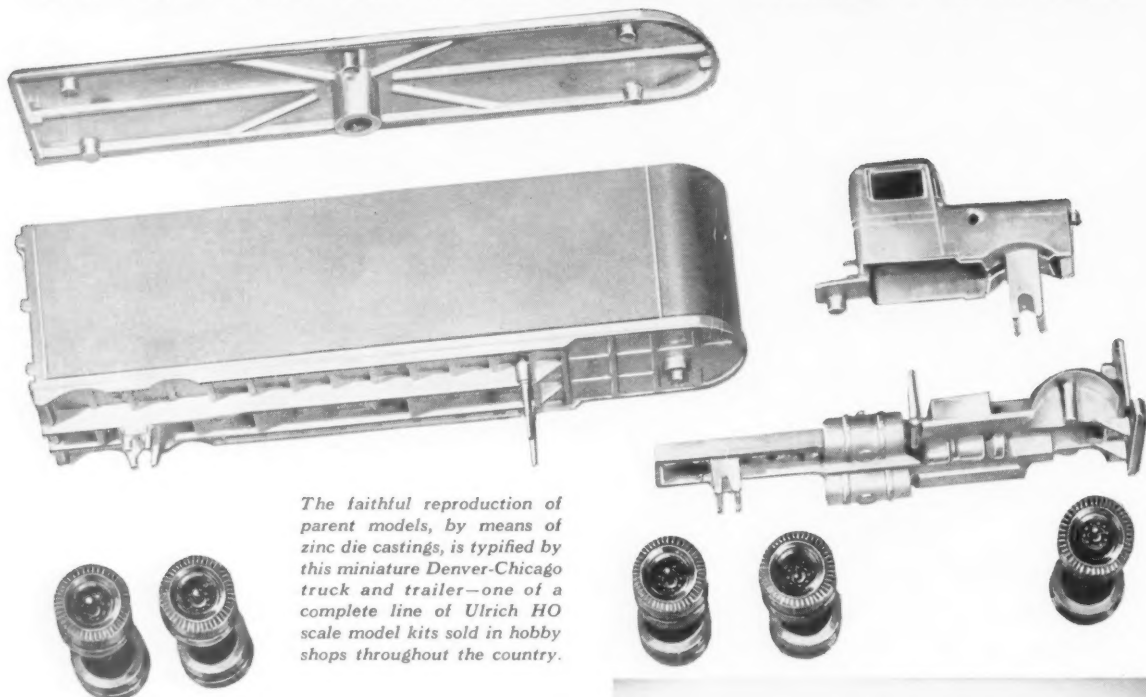
MACHINE TOOL BUILDERS SHOW
STOCKYARDS AUDITORIUM, BOOTH 109

PRODUCTION ENGINEERING SHOW
NAVY PIER, BOOTH 665-670



MACHINERY, August, 1955—93

WHY ZINC RATES FIRST IN DIE CASTING • NUMBER 4 OF A SERIES



The faithful reproduction of parent models, by means of zinc die castings, is typified by this miniature Denver-Chicago truck and trailer—one of a complete line of Ulrich HO scale model kits sold in hobby shops throughout the country.

clean-cut detail
as featured by
ULRICH



The ability to produce ZINC die castings with exacting, clean-cut detail is best illustrated by a few of the many castings employed in the scale model field. These Fruehauf trailer-truck components not only endow the Ulrich model kits with an appearance and "feel" of realism, but with extremely accurate HO scale dimensions (5/32"—1 ft.). And the ZINC die castings produced in long production runs are as alike as peas in a pod—without the need for elaborate machining.

Other ZINC die casting advantages utilized in scale model production (and in many other fields) are: *toughness*—to with-

stand rough usage; *smooth as-cast surfaces*—to take, and hold, any type of commercial finish; *integrally cast elements*—to provide economical and trouble-free means of assembly; *complexity of shape*—to make one part serve in place of several.

For other examples of product engineering with ZINC die castings in other fields, watch for our ads in this magazine in the months ahead. Send for our new brochure and contact any commercial die casting company regarding your particular production problems.



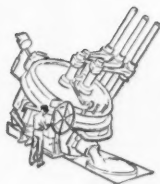
Send
for
your
copy



ZINC
FOR DIE CASTING ALLOYS

The New Jersey Zinc Company, 160 Front Street, New York 38, N. Y.

The Research was done, the Alloys were developed, and most Die Castings are based on
HORSE HEAD SPECIAL (99.99 + % Uniform Quality) ZINC



Tool Steel Topics



On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor:
Bethlehem Steel Export Corporation



2 Fine Tool Steels Team Up to Make Compound Die

This compound blanking, forming and piercing die is used by National Motor Bearing Co., Redwood City, Calif., in the production of cup cases for oil seals. The die is made up of two grades of Bethlehem tool steel: BTR and Lehigh H.

Hardened to Rockwell C 60-61, the long-wearing die forms the cup cases from plain carbon steel, stainless steel, and brass sheets. They range in diameter from $\frac{1}{2}$ in. to 14 in., and in thickness from 0.030 in. to 0.090 in. The die produces parts to tolerances of plus or minus 0.002 in., and produces up to 75,000 pieces before slight redressing is required.

BTR (Bethlehem Tool Room) is our general-purpose, manganese-chromium-tungsten grade of oil-hardening tool steel. Its main feature is its safe-hardening property. This, coupled with its sound combination of wear-resistance and toughness, makes BTR an ideal steel for all general-purpose tool and die applications.

Lehigh H is a high-carbon, high-chromium tool steel. It offers maximum wear and minimum distortion in heat-treatment. It is also a deep-hardening steel, in air, and thus has high compressive strength.

Your tool steel distributor will be pleased to furnish additional information about these fine Bethlehem tool steels. He'll welcome your call, right now.



BETHLEHEM TOOL STEEL ENGINEER SAYS:

Why and How to Stress-Relieve Tools

Stress-relieving is performed on tools to partially remove residual stresses resulting from machine work, mechanical straightening, hobbing, or other cold working. The reduction of stress is important in avoiding excessive distortion during tool hardening, as well as in avoiding the cracking that results from the addition of residual stress to the thermal stress produced when heating to the hardening temperature.

Stress-relieving is accomplished by heating the steel to from 1100 to 1300 F. Because of the relatively low temperature, surface protection against scale or decarburization is usually not required. As the temperature used is always below the transformation range of the steel, the rate of cooling is unimportant, except that it must not introduce thermal stress during cooling. Only a portion of residual stress is removed by this procedure. Up to the lower critical, the higher the stress-relieving temperature, the more completely is the stress removed.

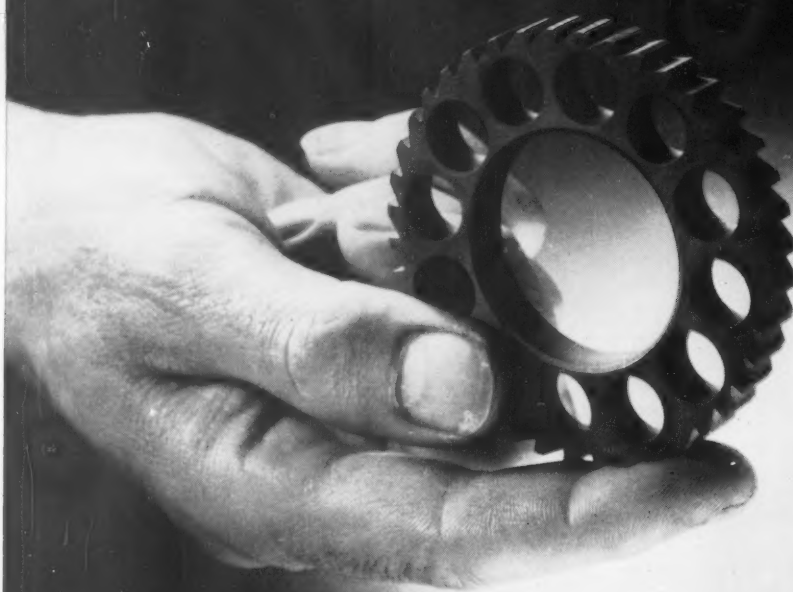
The degree of stress-relief afforded in this manner is usually sufficient. However, if complete relief of stress is required, a full anneal practice should be employed, including full austenitization and slow furnace-cooling.



TUBE MANDREL FOR SERVICE IN EXTRUSION PLANT

Shown during a finishing cut, this tube mandrel will see service in the extrusion plant of Kaiser Aluminum & Chemical Corp., Halethorpe, Md. The mandrel is made of Bethlehem Cr-Mo-W (chrome-moly-tungsten) tool steel. Cr-Mo-W is an all-around hot-work steel containing 5 pct chromium. It is especially suited for jobs that involve shock and drastic temperature changes, as well as for jobs where heat-checking is a problem.

a difficult piece to HARDEN . . .



. . . yet it gave no trouble

thanks to

SAGAMORE

DIE STEEL

Note the complex section of this small ratchet driven friction clutch. Yet, with non-deforming Sagamore Die Steel, there is no distortion or size variation in the intricate webbing.

After being machined from a 3" round bar of Ludlum Sagamore, the clutch was hardened from 1775 F. The piece was air cooled and then drawn at 600 F. The result, a Rockwell C hardness of 55/56.

Ludlum Sagamore is a relatively new type of non-deforming die steel which has had a rapid increase in popularity. It combines excellent non-deforming properties and unusual toughness with freedom from hardening hazards. Similar to high carbon-high chromium steels in behavior and applications, Sagamore has the added advantages of lower hardening temperatures, easier machining and grinding, greater toughness and lower costs.

There's an A-L tool steel to help solve your toughest tool steel problems. Call your nearest office or distributor today, or write *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania.*



Write for your
SAGAMORE BLUE SHEET

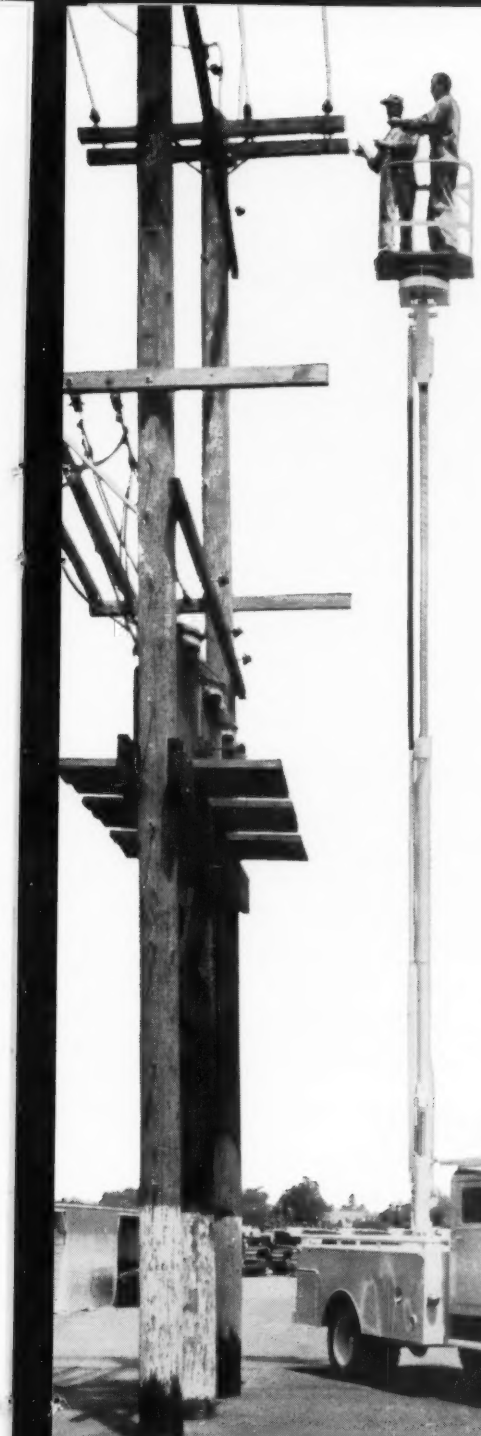
A concise 4-page booklet of facts on the handling and shop treatments of Sagamore. Included is complete information on forging, annealing, tempering, etc. and detailed laboratory data on physical characteristics. Ask for your free copy.

Address Dept. M-68

For complete MODERN Tooling, call
Allegheny Ludlum

W&D 5349





Industrial Monkey Gets a "Lift" from SHELBY SEAMLESS TUBING

The versatile Industrial Monkey* is ideal for all types of high work operations including tree-trimming, line work, street light servicing, painting, shipyard work, airplane servicing, and fire fighting.

The basic Industrial Monkey unit consists of a hydraulically-operated telescoping boom with a self-leveling work platform. The boom, mounted on a base, swings in a 270 degree arc and operates from the horizontal to vertical at a working height of 50 feet. All movements are electrically controlled, either from the work platform or from dual controls in the truck upon which the unit is mounted.

*Manufacturer's name on request.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS

UNITED STATES STEEL EXPORT COMPANY, NEW YORK



Shelby Seamless Mechanical Tubing

SEE THE UNITED STATES STEEL HOUR. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

All Shelby Seamless Tubing is pierced from solid billets of uniform steel. This is the one manufacturing method that assures absolute uniform wall strength.



UNITED STATES STEEL



Lifting capacity of this Austin-Western crane was increased 350% by replacing cylindrical worm gearing with Cone-Drive gearing. The boom lifting mechanism

is driven by a 6" center distance 50:1 Cone-Drive Gearset powered by hydraulic motor. A similar 5" center distance 40:1 Cone-Drive unit swings the crane.

350% more lifting capacity with help from nickel alloys

DON'T ADD BULK or deadweight to increase load capacity.

Cone-Drive gearsets that raise and swing the boom of this crane show how you can strengthen an assembly while making it more compact.

Cone-Drive mates a nickel alloy steel worm with gearing of chill-cast nickel alloyed bronze. Added to bronze, nickel imparts extra life and strength, raises elastic properties, and increases shock resistance as much as 25 to 50 per cent.

Likewise, nickel contributes much to the worm. Cone-Drive worms are

medium-carbon nickel-chromium-molybdenum steel, heat treated to a minimum hardness of 32 Rockwell C and 140,000 psi tensile strength.

The nickel content in this steel helps make possible a surface that resists wear and spalling . . . and a core with the toughness to withstand severe overloads.

In many a metal, you can improve specific properties by use of nickel alone or in combination with other alloy elements. When you have a metal problem, whatever the difficulty, send us details. We'll be glad to give you suggestions based on our wide experience in this field.



Give compact units stamina by designing to use high mechanical properties of nickel alloys. Above is such a unit, produced by Cone-Drive Gears Division of Michigan Tool Co., Detroit 12, Mich.



THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street
New York 5, N. Y.



**THE MORE KNOW-HOW
YOU PUT IN THE BARREL,
THE MORE PROFIT
YOU TAKE OUT**

Useful facts gathered during Oakite's years of experience in barrel finishing are packed like #12 stones in this 10-page booklet covering such subjects as:

PRECLEANING—Good tank cleaning; Good barrel cleaning; Good rinsing saves money.

CUTTING DOWN, DEBURRING—Good solutions; Abrasive media, water and work ratios, etc.

PICKLING, DESCALING, BRIGHT DIPPING—Good solutions for steel, brass, aluminum, etc.

BURNISHING—Good solutions; Burnishing media; water and work ratios, etc.; How to overcome water hardness; How to keep barrels and media clean; How to prevent rusting, tarnishing and other corrosion.

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Visit Oakite
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FREE... For your copy of "May I put my head in your finishing barrel?" just write or mail the coupon.

Technical Service Representatives in
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SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS • METHODS • SERVICE

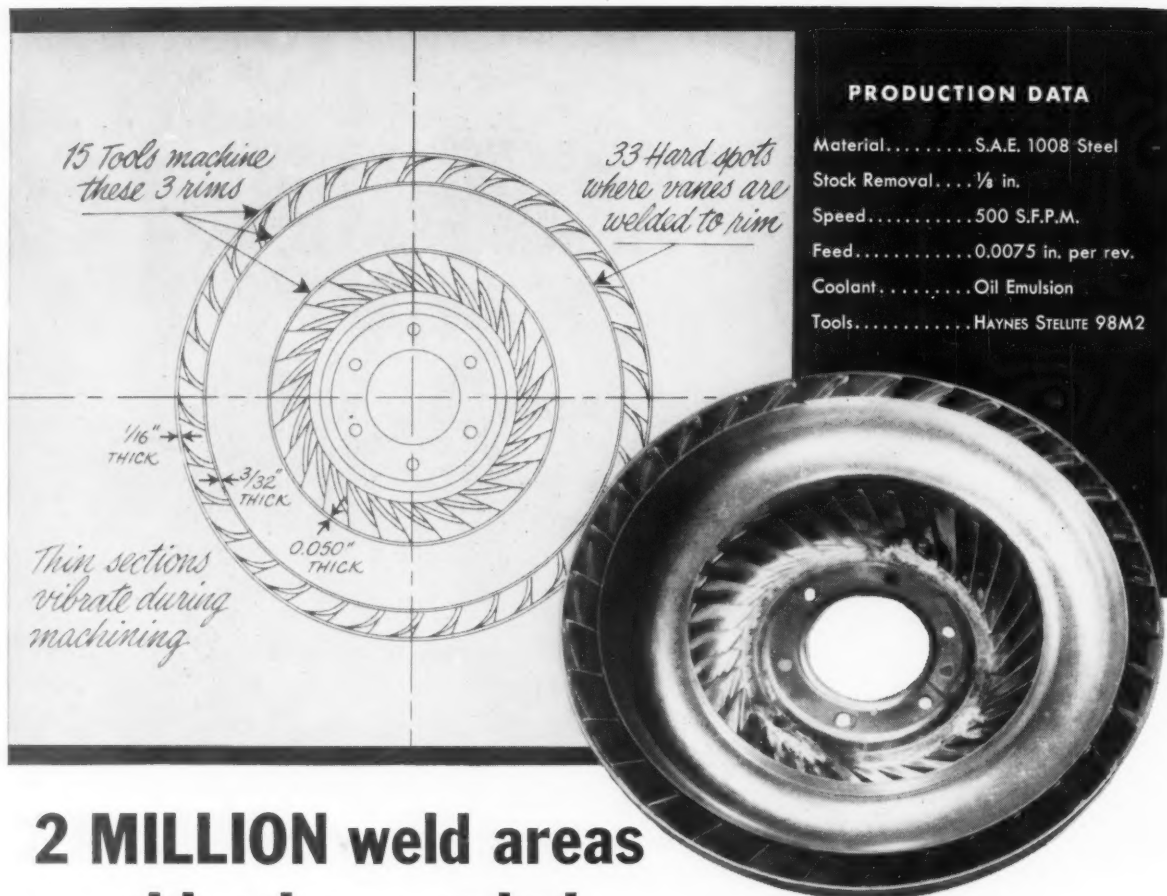
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26 Rector St., New York 6, N. Y.

Send me a **FREE** copy of your booklet on Barrel Finishing.

Name _____

Company _____

Address _____



2 MILLION weld areas machined per grind

HAYNES STELLITE 98M2 tools machine 1,000 of these torque converter turbine wheels between grinds. Fifteen tools are used to machine the three rims. There are 33 weld areas on one of the rims where the vanes are joined to it. On every revolution a HAYNES STELLITE tool cuts through these hard spots. It makes 2,100 interrupted cuts per wheel . . . over two million per grind. In addition, all 15 tools must withstand the shock set up by vibrations of the thin sections.

The parts are double indexed on an automatic lathe at

six stations. Spindle speed is about 160 revolutions per minute. Feed rate is 0.0075 in. per revolution. Machining speed is 500 surface feet per minute. Total machining time per turbine is 28 seconds, and approximately 125 wheels are finished in an hour. The HAYNES STELLITE tools operate for a full eight-hour shift without chipping or spalling.

HAYNES STELLITE tools have an unusual combination of red hardness and toughness. They remove metal fast because they can take deep cuts at heavy feeds. For full details write for the booklet, "HAYNES STELLITE Metal-Cutting Tools."



HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

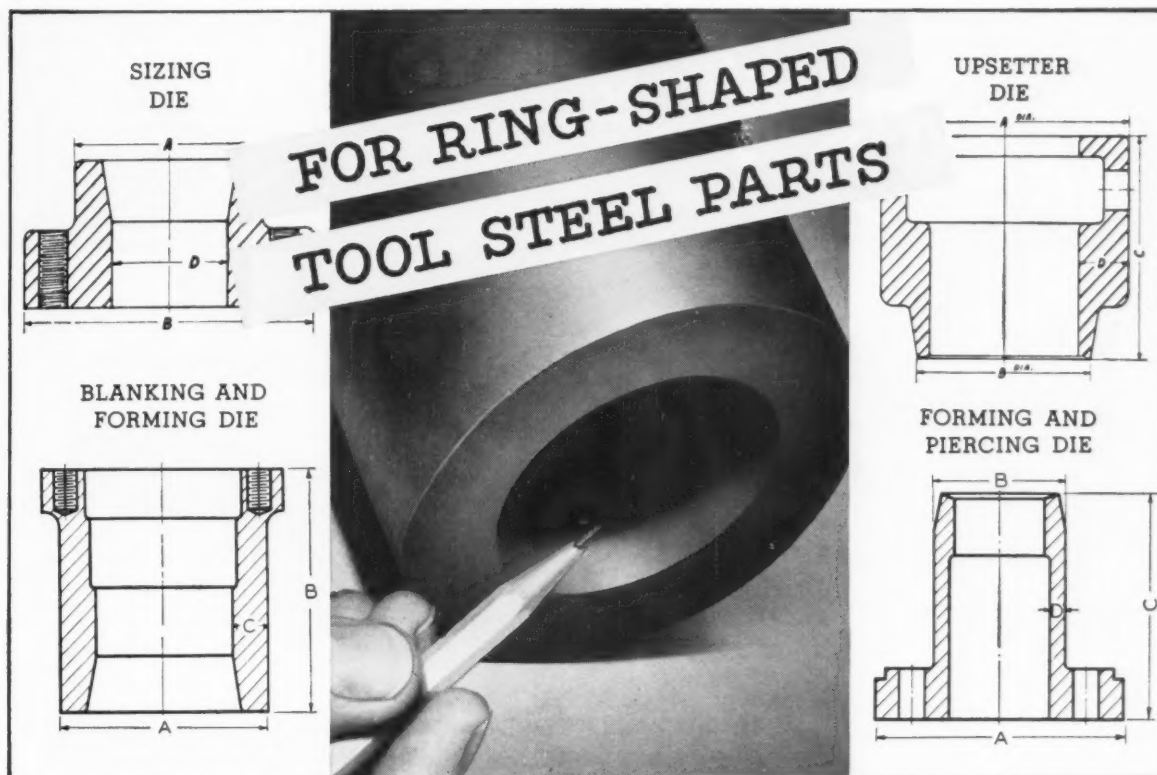


General Offices and Works, Kokomo, Indiana

Sales Offices

Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa

"Haynes," and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation.



New Graph-Mo Hollow-Bar eliminates drilling, machines 30% faster

MAKERS of ring-shaped tool steel parts who use Graph-Mo Hollow-Bar will tell you it speeds up production, cuts down waste, and saves steel. That's because the hole is already in it. There's no drilling, you start with finish boring.

What's more, you get all the proved advantages of Graph-Mo that have made it one of the most popular tool steels—excellent machinability, wearability, and stability.

Graph-Mo machines 30% faster than other tool steels and has a minimum tendency to scuff or gall. The combination of free-graphite and diamond-hard carbides in its structure gives it exceptional wearability. Users report that Graph-Mo outwears other tool steels on an average of 3 to 1.

Graph-Mo also is the most stable tool steel ever made. For instance, a Graph-Mo steel master plug gage showed less than 10 millionths of an inch in dimensional change after 12 years of use. And Graph-Mo responds uniformly to heat treatment, too.

If you make ring-shaped tool steel parts, make sure you get all the advantages of Graph-Mo Hollow-Bar. Sizes range up to 16" O.D. with a variety of wall thicknesses. It's made by the specialists in fine alloy steels, The Timken Company.

Graph-Mo Hollow-Bar is distributed through A. Milne and Co. and the Peninsular Steel Co. warehouses.

To find out more about this tool steel, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

For more information on products advertised, use inquiry Card, page 245

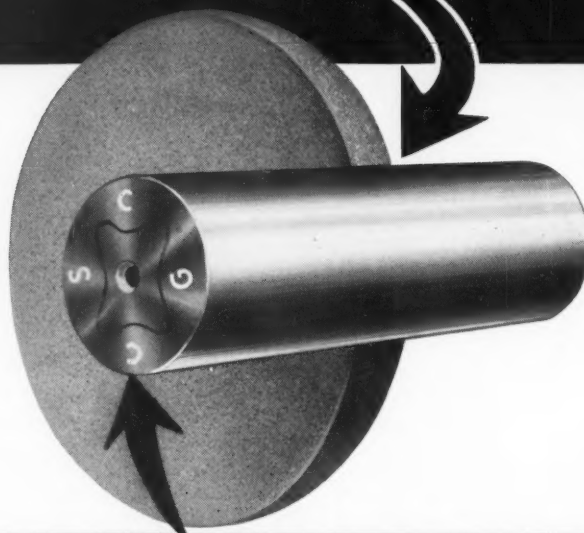
MACHINERY, August, 1955—101

An exclusive GRINDING PROCESS...

makes

CUMBERLAND STEEL BARS

concentric, straight,
smooth & *really* accurate



BE SURE OF THIS MARK ON THE END OF YOUR SHAFTS

CUMBERLAND GROUND BARS FOR ALL TYPES OF MACHINES

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002" on diameters 1-1/8" to 2-7/16" inclusive . . . plus nothing to minus .003" on diameters 2-1/2" to 8" inclusive. Closer tolerance can be furnished, if desired. And, remember, Cumberland Steel Bars are the end result of 109 years' experience,—and every bar is *carefully tested* before shipment. The list of Cumberland's customers reads like the "Blue Book" of Industry. Ask for further information.

MANUFACTURED IN THREE SPECIFICATIONS

Cumberland Brand—AISI C-1020/C-1025, Elastic Limit 30,000# Min.

Potomac Brand—AISI C-1040, Elastic Limit 45,000# Min.

Cumsco Brand—AISI C-1141, Elastic Limit 57,000# Min.

CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U.S.A.

ESTABLISHED 1845

INCORPORATED 1892



one
is always out front
...and with high speed steels
the pace setter is REX

Crucible's REX high speed steels have been way out in front ever since their introduction. And today they're still the *standard for comparison* wherever high speed steels are used.

There are many good reasons for REX's leadership — uniformity of size, structure, finish, response to heat treatment, tool performance. Each factor can be proved in your own shop, on your own work. So try this *standard for comparison* on a few jobs and you'll agree with thousands of users — *you can't find a high speed steel to outperform REX.*

Because of its extensive, nationwide use, REX high speed steel is carried in stock by the coast-to-coast chain of Crucible warehouses, or is available on quick mill delivery. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

Visit us at Booths 830-832
 Production Engineering Show, Sep-
 tember 6-16, Navy Pier, Chicago.

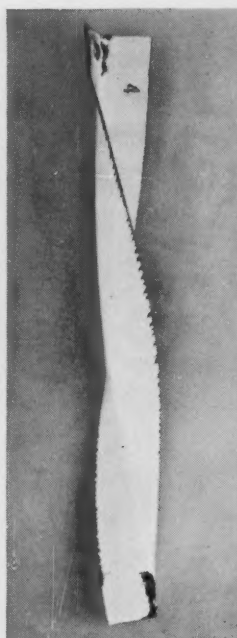
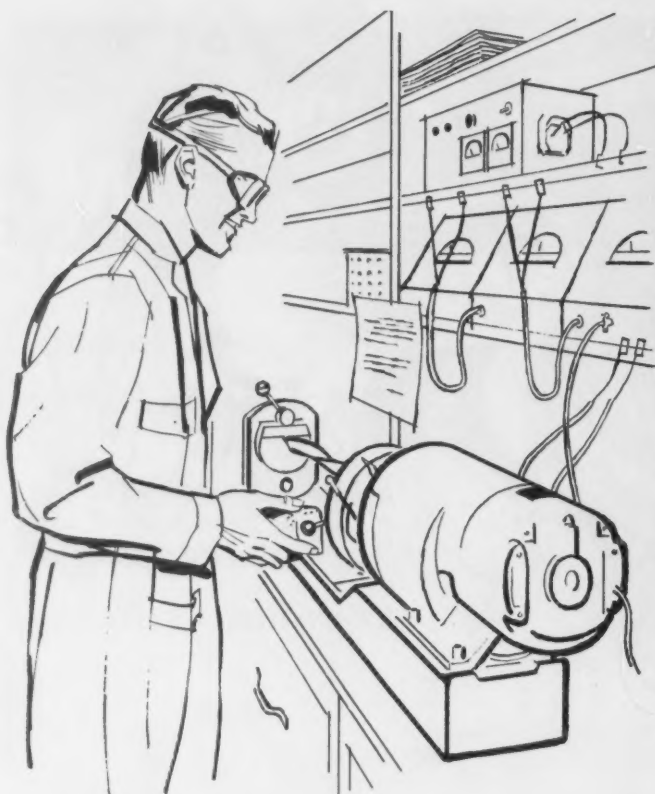
CRUCIBLE

first name in special purpose steels

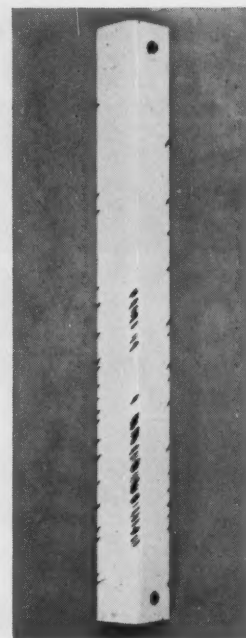
Crucible Steel Company of America

For more information on products advertised, use Inquiry Card, page 245

MACHINERY, August, 1955—103



Enameling iron, with 1 coat of porcelain enamel over Parker Pre-Namel 410, was twisted 255° before enamel fractured.



Enameling iron, with conventional 2-coat system of porcelain enamel, fractured badly when twisted only 70°. (Twisted less than its elastic limit, metal returned to its original shape).

NEWS OF A REVOLUTION *that's about to happen!*

Porcelain enameling on steel has always been a preferred finish. However, its use has been limited by cost and by difficulties in the processing.

Now, a big change is about to take place. It is coming about through a cooperative effort that we feel should be acknowledged.

First, Parker Rust Proof Company's research discovered and developed a surface treatment for steel which permits the application of the porcelain enamel finish coat directly to ferrous metals, reduces cost, improves quality and eliminates many production difficulties in porcelain enameling. For production evaluation, Frigidaire Division of General Motors and Pemco Corporation

entered the effort with pilot runs and production tests.

The new treatment, making use of Parker Pre-Namel 410, has been shown to simplify porcelain enameling, achieve high quality uniform results, reduce use of frit, produce a more durable finish. Savings of from 1 to 3 cents per square foot of enameling surface are indicated.

We gratefully acknowledge the help we've had from Frigidaire and Pemco. Here is another instance of companies in diverse lines cooperating in a development program today which should benefit hundreds of manufacturers and millions of their customers in the future.

*Bonderite, Bonderlube, Parco, Parco Lubrite, Parker Pre-Namel—Reg. U.S. Pat. Off.

Since 1915—Leader in the Field



PARKER RUST PROOF COMPANY

2194 E. Milwaukee, Detroit 11, Michigan

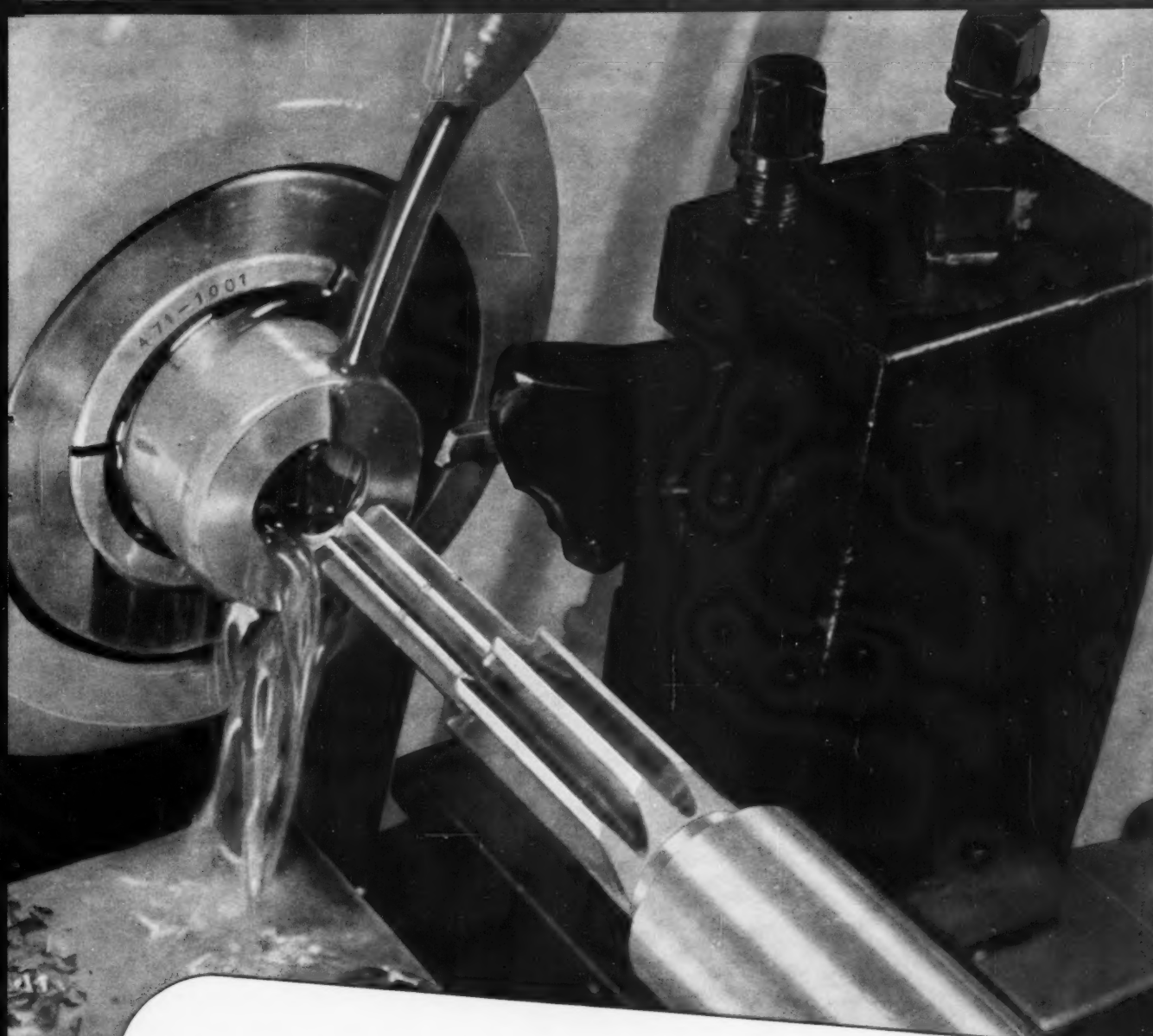
BONDERITE
corrosion resistant
paint base

BONDERITE and BONDERLUBE
aids in cold forming
of metals

PARCO COMPOUND
rust resistant


PARCO LUBRITE
wear resistant for friction
surfaces

TROPICAL
heavy duty maintenance
paints since 1883



CLEVELAND *Special* TOOLS

Designed and Engineered by Craftsmen

All CLEVELAND Special Tools are manufactured to the same high standards of quality as regular tools bearing the famous  trademark. Why not take advantage of CLEVELAND's experience, "know-how" and service in designing, producing and testing special Drills, Reamers, End Mills or other tools for your next job?



THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

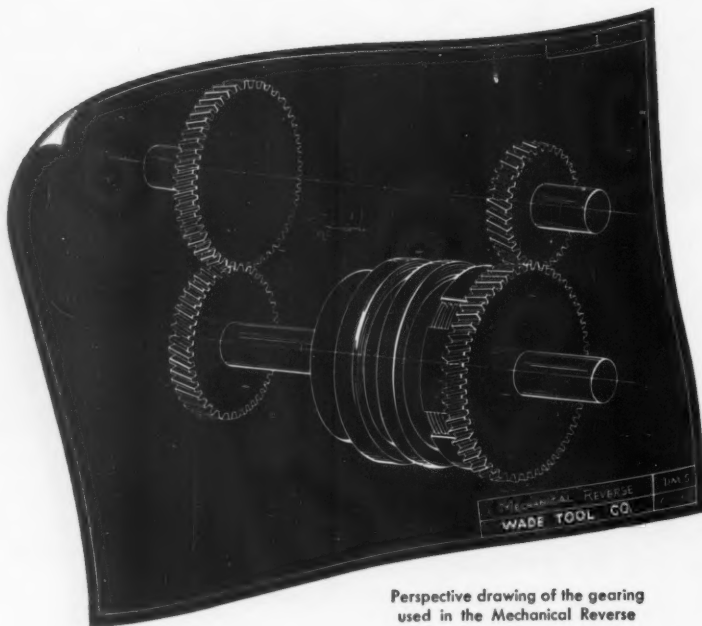
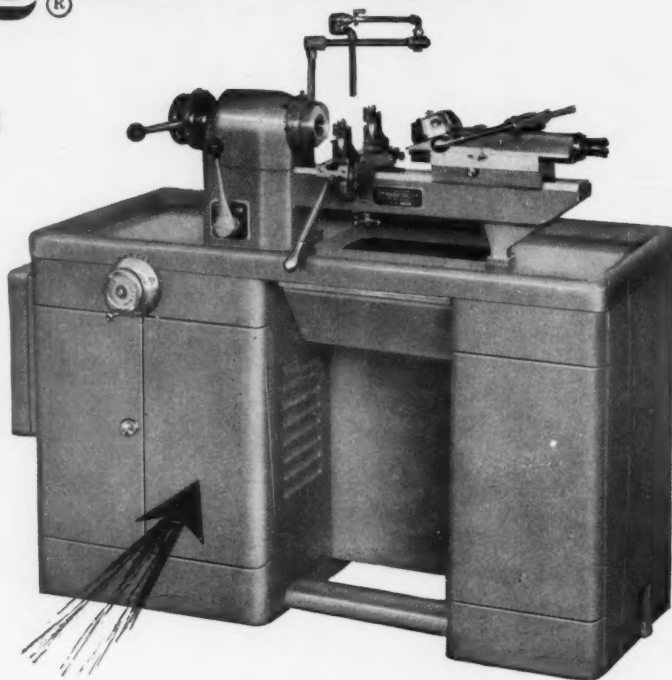
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58
E. P. Barrus, Ltd., London W. 3, England

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

the **Wade**® REVERSE*

CONTINUOUS REVERSE

The arrow indicates the location of
a feature that is built into the Wade
#73, and obtainable on no other
second operation machine ...
it's the production-tested Mechani-
cal Reverse.



Perspective drawing of the gearing
used in the Mechanical Reverse

no. 73 Hand Turret Lathe

A single lever mounted on the lathe bed not only controls the high-low spindle speeds of 5-to-1 ratio, but it also actuates the Mechanical Reverse. This lever brakes the headstock spindle and throws it into reverse without stopping and starting the motor!

Cycles of up to 32 reversals per minute allow production increases of as much as 100% on your tap or die work.

If this feature interests you, investigate the full advantages of the Wade No. 73 by writing today for a circular illustrating this versatile machine.

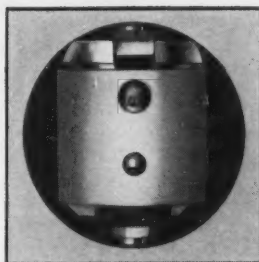
*Wade Exclusive, Patent applied for *write for descriptive folder and prices* | **52 River St.**

THE WADE TOOL CO.

WALTHAM 54, MASS., U.S.A.

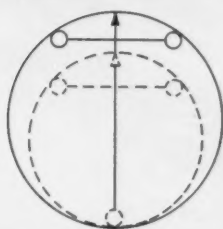
MAKERS OF
PRECISION TOOLS FOR
AMERICAN INDUSTRY

This is IT



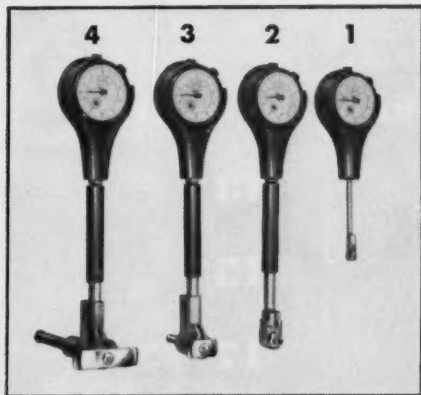
The New DIAL INDICATOR BORE GAGE

FOOLPROOF CENTRALIZATION



Centralizer places contacts
on true diameter of hole.

Model 1250P-Series



- Meets the great majority of all hole inspection needs.
- Longer gaging range.
- Four gages inspect all diameters from $\frac{1}{2}$ " to 8".
- Accuracy protected from handling temperature.

These new Gages definitely meet the accuracy requirements of nearly all hole diameter inspections . . . and at a cost considerably less than that of more elaborate gaging equipment.

They are designed to give accurate centralization for setup with gage blocks, micrometers, master rings, or other suitable device.

Write for complete details of the Model 1250P-Series Bore Gage to —

FEDERAL PRODUCTS CORPORATION
Dept. 3G Providence 1, Rhode Island

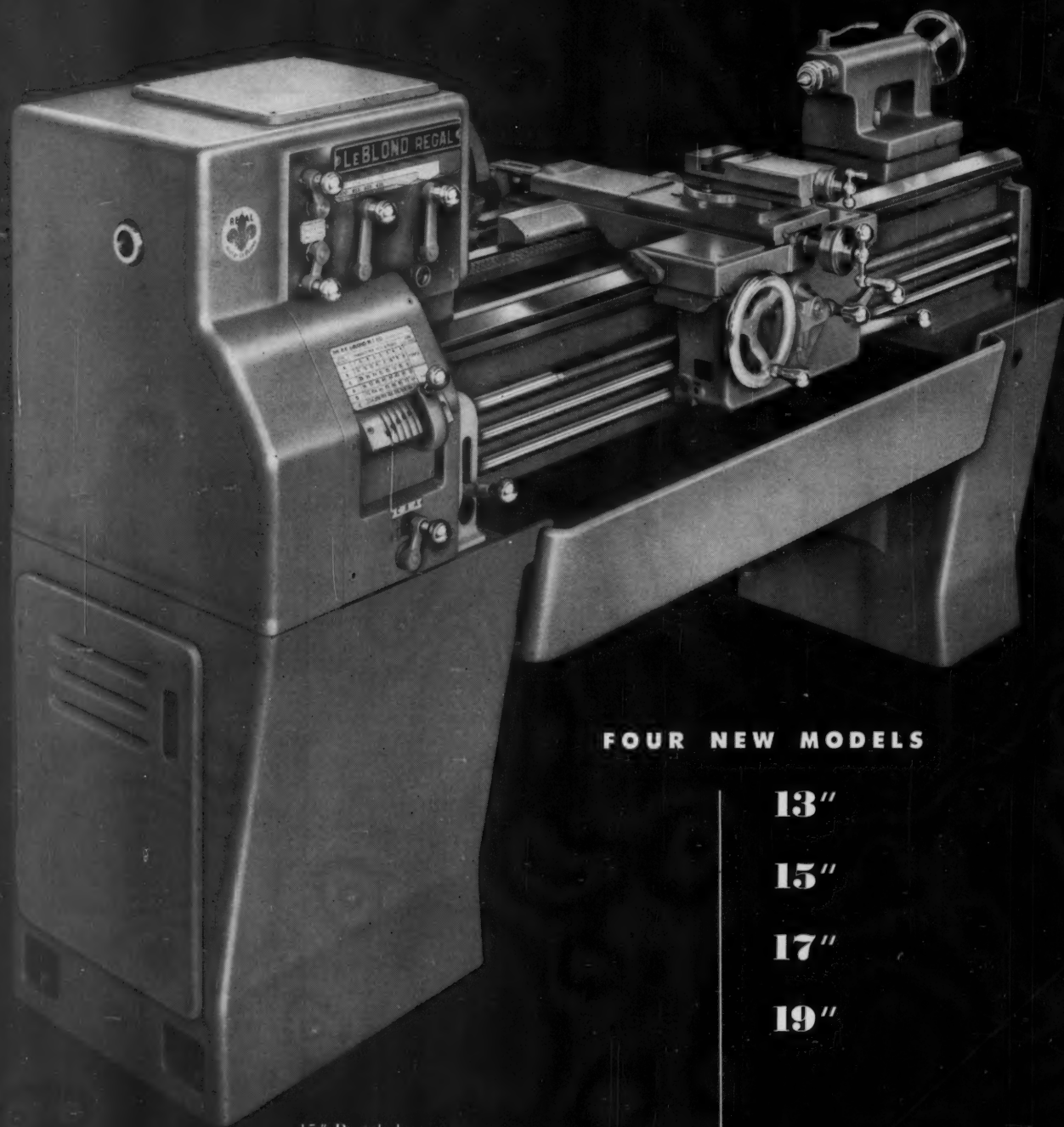
Ask **FEDERAL**

FOR MODERN GAGES AND GAGING TECHNIQUES . . .

Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, or Automation Gaging

cut with confidence . . .

HERE'S THE



FOUR NEW MODELS

13"

15"

17"

19"

15" Regal shown

NEW L^{EB}BLOND REGAL

The only lathe in its class with so many big-lathe features

Designed and built like heavy-duty lathes, the new LeBlond Regals will give you long life of precision production, minimum maintenance and the kind of dependability you'd expect from a much higher-priced machine!

Consider, for example, the new Regal headstock. It uses the same combination gear-belt drive construction that proved itself on the famous LeBlond Dual-Drive and is now incorporated on our new 16" heavy-duty lathe. Then take a look at the new bed with hardened and ground replaceable steel ways. Like the ways on our heavy-duty machines, they are fitted according to the compensating veeway principle to insure better distribution of forces for proven long-time accuracy and minimum wear.

Again, like higher-priced lathes, Regals are equipped with *both* feed rod and leadscrew for continued accuracy in thread chasing. Other big-lathe features—3-bearing spindle. Automatically lubricated quick-change box. Wide carriage bridge with ample bearing surface. Rugged tailstock with plug clamping. Plus general dimensions and construction details patterned after LeBlond heavy-duty lathes.

Only from the builder of a complete line of lathes can you get a low-priced lathe with true big-lathe features. All of LeBlond's 68 years of experience has gone into the design and building of these new Regals. Be sure you get all the details; see your LeBlond Distributor or write for Bulletin R-200-D.

	13"	15"	17"	19"
Swing over bed and carriage wings	14"	15½"	17¼"	19¼"
Spindle speeds, number	12	12	12	12
Spindle speed range, rpm.	45 to 1800	30 to 1200	38 to 1500	25 to 1000
Feeds and threads, number	48	48	48	48
Feed, range, in. per rev.	.0018—.106		.002—.116	
Threads per inch, range	4—224		2—112	
Horsepower	2	3	3	5



SEE IT AT THE SHOW

#1313

Dead center of the new Exhibition Hall.

... cut with confidence

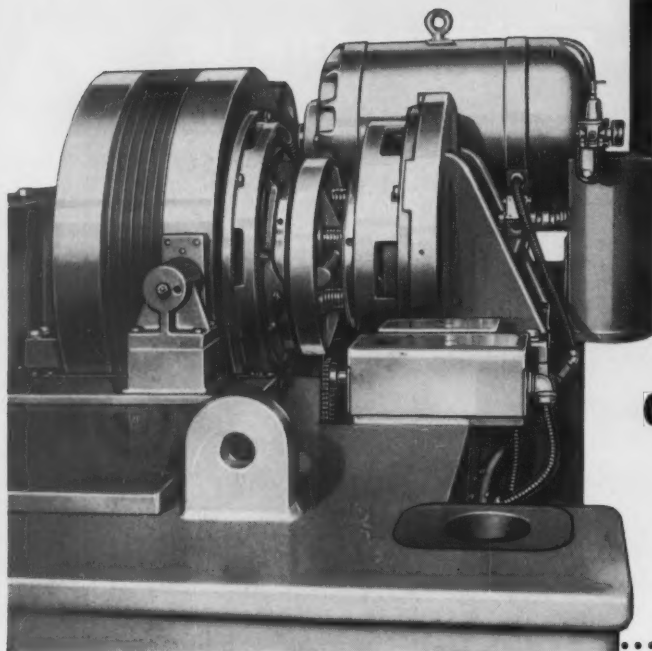
THE R. K. LEBLOND MACHINE TOOL COMPANY
CINCINNATI 8, OHIO



WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • FOR MORE THAN 68 YEARS

For more information on products advertised, use Inquiry Card, page 245

MACHINERY, August, 1955—109



*These are the features
that make **Verson**—
presses your best buy*

THE



CLUTCH AND BRAKE UNIT

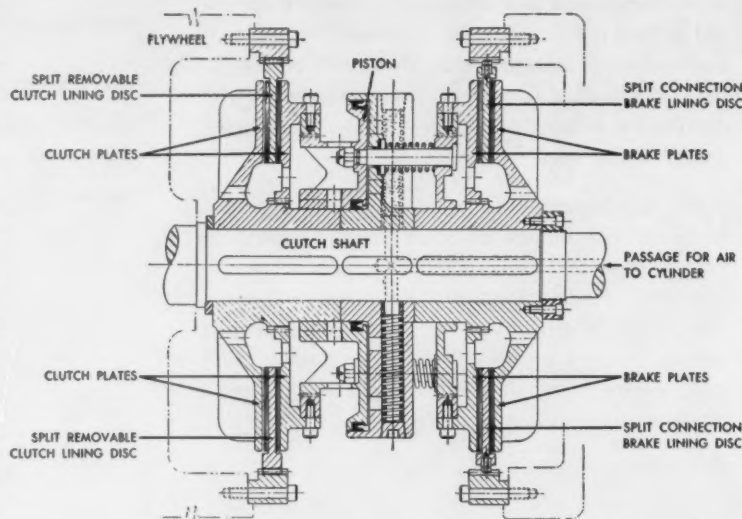
**No tricks—
just top notch
performance**

The drawing at the right shows the construction and operation of the Verson clutch and brake unit.

With the clutch disengaged, powerful brake springs clamp brake plates against the stationary brake disc. The brake disc is mounted to the press frame in a manner that will permit axial motion but will oppose rotation.

To engage the clutch, air is admitted to the operating cylinder through a passage in the drive shaft. This forces the piston out, compressing the brake springs and releasing the brake. Further motion of the piston engages the clutch thereby transmitting the motion of the flywheel to the clutch shaft.

When air pressure in the operating cylinder is released, the brake springs pull the piston back, first disengaging the clutch and then engaging the brake.



The Verson Pneumatic Clutch and Brake Unit is the heart of Verson mechanical presses. It is a mechanically interlocked type which eliminates all possibility of overlap between clutch and brake. Drag cannot occur, efficient power application is assured and wear on clutch and brake linings is minimized. Shock and vibration are also minimized for longer press life. This is no trick clutch . . . it is a soundly designed unit that

has been proved in countless hours of abusive tests and years of field experience.

The Verson Pneumatic Clutch and Brake Unit is just one of many reasons why it pays to specify Verson Presses for your requirements. We'll be happy to tell you the whole story. For specific recommendations, send an outline of your requirements.

Ask us about our new customized
installment and leasing programs.

A Verson Press for every job from 60 tons up.



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IN
ACTION**

Lo-swing

**EXHIBIT
SPACE 1013**



NEW LATHES



A NEW DRILLING HEAD



A NEW AUTOMATIC LOADER

**A NEW DRILLING, REAMING,
AND TAPPING MACHINE**



**THE
MACHINE TOOL
SHOW**

**CHICAGO, ILL.
SEPT. 6-17, 1955**

INTERNATIONAL AMPHITHEATRE



SENECA FALLS MACHINE COMPANY • SENECA FALLS, N. Y.

The story of 5 benefits Wayne Screw Products gets from using STANICUT CUTTING OIL



Plant Foreman Al Ziegman (left) and Standard industrial lubrication specialist L. J. Loomis examine pitch diameter of screw threads. L. J. Loomis' engineering background plus his field experience in industrial lubrication, customers find, pays off for them. Lee is a graduate of Tri-State college of Indiana with a B.S. degree. Before entering field work, he completed Standard Sales Engineering School.

STANICUT Oil 137 BCS solved finish problem for Wayne Screw Products Company, gave better finish on screw and machined parts like these—plus four other important benefits.

Management at Wayne Screw Products Company, Detroit, found they were not getting a completely satisfactory finish on aircraft quality stainless steel, which the plant was machining. They followed a suggestion made by their Standard Oil lubrication specialist to switch to STANICUT Oil 137 BCS. The result: five benefits.

- 1 Better finish
- 2 Higher quality work
- 3 Longer tool life
- 4 Higher production because of less down time for tool sharpening and adjusting
- 5 Cutting oil costs reduced approximately 50%

At first STANICUT Oil 137 BCS was used in two automatic screw machines—a National Acme Multi-Spindle and a Brown & Sharpe Single Spindle. Production benefits prompted Wayne Screw Products to convert other equipment to STANICUT Oil 137 BCS—and with similar results.

Delivering benefits like this is an old story for STANICUT Oil 137 BCS. A Standard Oil lubrication specialist will be happy to demonstrate how Standard's cutting oils can perform with similar results for you. In the Midwest, a call to your nearby Standard Oil office will bring a prompt response. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



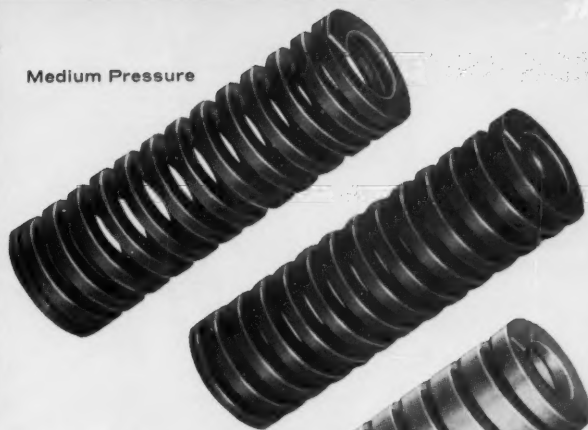
STANDARD OIL COMPANY
(Indiana)

3

COMPLETE PRESSURE RANGES TO CHOOSE FROM!

See Danly's New Die Spring Line...

Medium Pressure



Medium-high Pressure

High Pressure

Now, you can design longer spring life into your dies. The new Danly Die Spring Line offers you 236 different springs to choose from—with the range of characteristics you've been looking for. Design of all springs in this new line is based on fatigue testing through millions of compressions at recommended loading and deflection.

Select the die springs you need from the new Danly line and get exactly the deflection, spring rate and size you want.

Send For New Catalog...

The new Danly Die Spring Catalog makes selection of the right die spring easier than ever before. Contains complete pressure and deflection data, as well as dimensions. Here are some of the unusual features of this catalog:

- **New Method of Selection** . . . new "step-by-step" selection method simplifies choosing the proper die springs to meet any given problem.
- **Simplified Charts** . . . the regular spring tables are read "straight across" and contain complete details to minimize confusing cross references.

Send for your FREE copy today.



Shown above is a spread from the new Danly Die Spring Catalog—detailing the simplified spring selection procedure worked out for you.

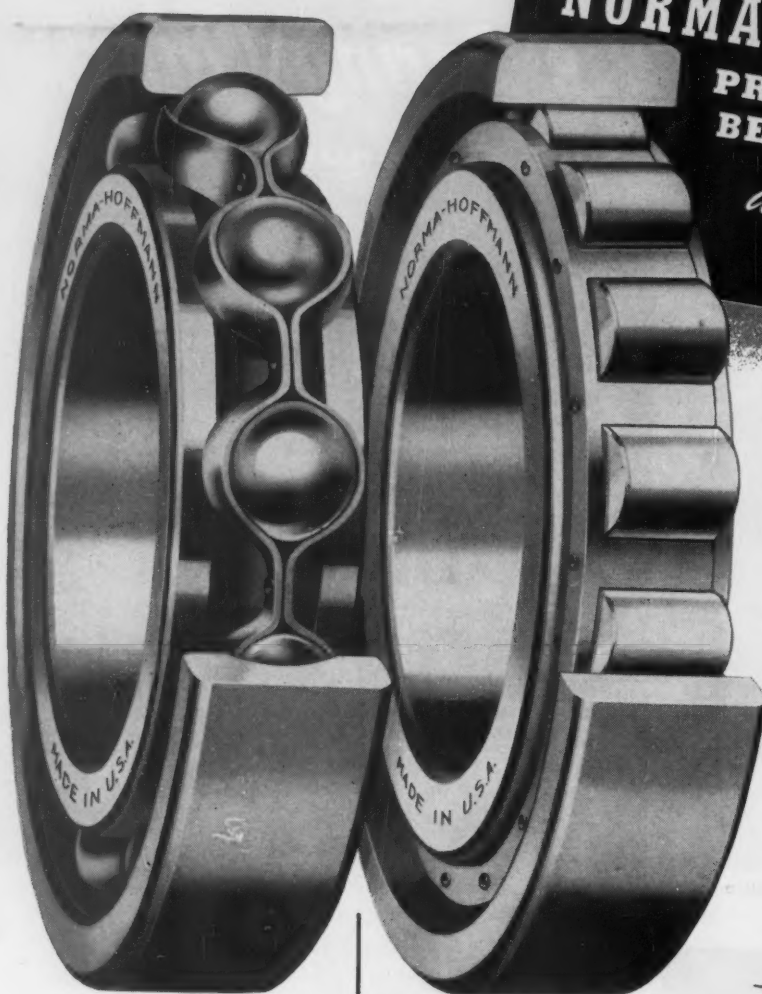
DANLY



DIE SETS . . .
STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue • Chicago 50, Illinois



NORMA-HOFFMANN BALL BEARINGS

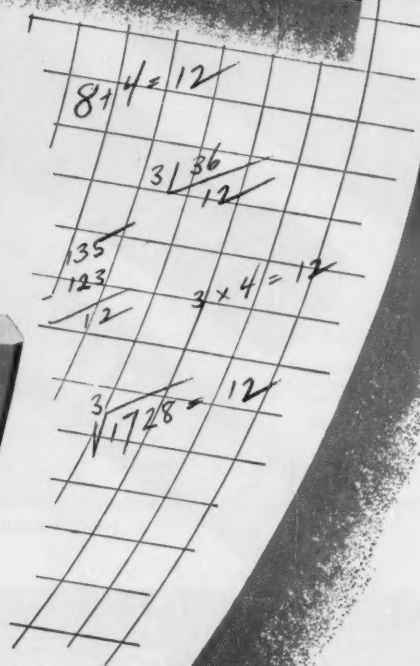
Rugged—thoroughly dependable for carrying thrust and radial loads.

NORMA-HOFFMANN ROLLER BEARINGS

Short, cylindrical roller design... heavy-duty bronze retainer... lowest possible co-efficient of friction under heavy load.

Norma-Hoffmann heavy-duty Bearings improve the design and performance of products wherever they are used. They are dependable, give friction-free smoothness and quietness of operation. Available in a wide range of sizes for every load, speed and duty. Write for catalog and engineering assistance.

Any way you figure it
NORMA-HOFFMANN
**PRECISION
BEARINGS**
*are the Right
Answer*



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Precision BEARINGS
BALL • ROLLER • THRUST

NORMA-HOFFMANN BEARINGS CORPORATION
STAMFORD, CONNECTICUT—Founded in 1911

FIELD OFFICES: Atlanta, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Kansas City, Los Angeles, San Francisco, Seattle.

KNOWN by the company they keep



PRATT & WHITNEY KELLERFLEX CARBIDE BURS

Able to cruise around the world at comparatively high speeds without surfacing, the atomic-powered submarine, USS Nautilus, is a giant stride into the future by American science and industry.

Throughout construction of this most advanced of all underseas craft by Electric Boat Division of General Dynamics Corp., P&W Kellerflex Burs — representing the ultimate advances in bur technology — were used exclusively. And aboard the Nautilus — where each part is weighed to the ounce and only the most essential equipment is carried — it is also significant that P&W Kellerflex Burs are included in the tool kits.

Yes, wherever only the finest will do, you'll find Pratt & Whitney Kellerflex Carbide Burs. For complete information, write on your Company letterhead for Circular No. 564.

SEE THEM AT BOOTH 1219

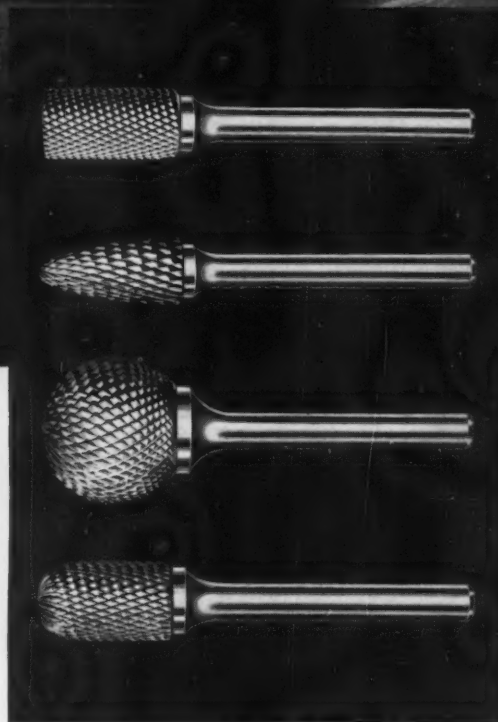


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PRINCIPAL CITIES THROUGHOUT THE COUNTRY

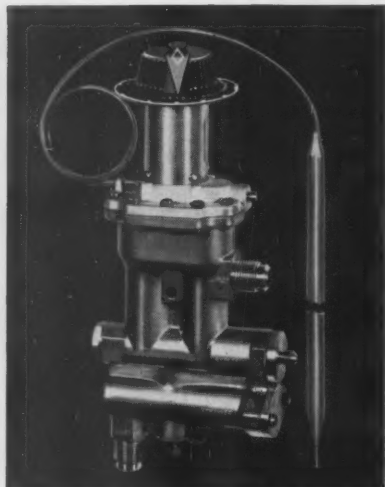
MACHINE TOOLS • CUTTING TOOLS • GAGES

manufacture of

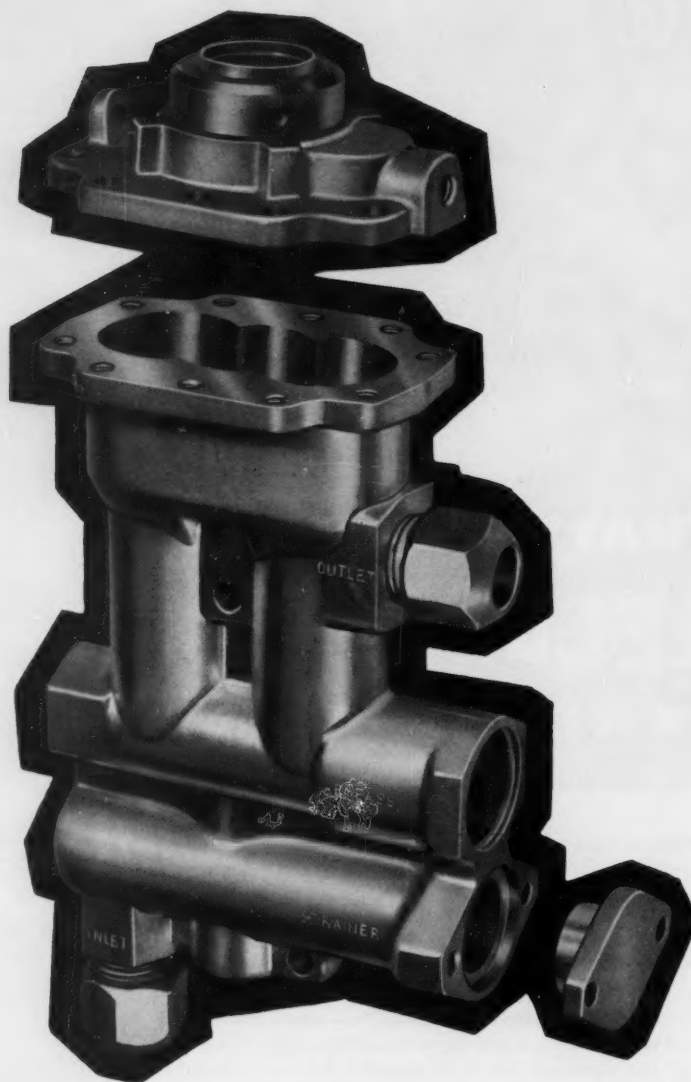
DETROIT SELECTAFLOW CONTROLS

greatly improved by

MUELLER BRASS CO. FORGINGS



One of the finest thermostat control mechanisms for year-around air-conditioning systems is the automatic SELECTAFLOW, a product of the Detroit Controls Corporation. To maintain the high quality of this efficient unit and at the same time speed up and simplify assembly, the body, bonnet and side cover are being forged and completely machined to close tolerances by the Mueller Brass Co. In all, thirty-four machining and finishing operations are performed. This is but one more example of how Mueller Brass Co. machined forgings have improved a product and speeded production. With a wide range of copper-base alloys for forgings, a tremendous background of product engineering, and facilities for precision finish machining, the Mueller Brass Co. can supply machined brass or bronze forgings to your exact specifications. It will pay you to consider Mueller Brass Co. forgings for your new or redesigned products. Write us for full color catalog and technical information.



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SPIRAL BEVEL GEARS



HYPOID BEVEL GEARS



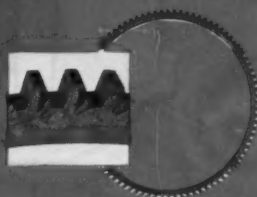
ZEROL BEVEL GEARS



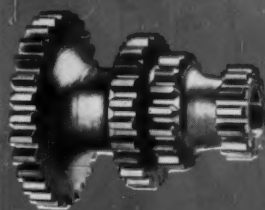
STRAIGHT BEVEL GEARS



ANGULAR BEVEL GEARS



FLYWHEEL RING GEARS



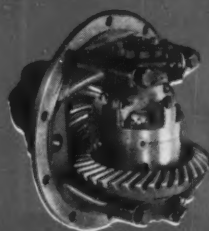
SPUR GEARS



HELICAL GEARS



SPLINE SHAFTS



GEAR ASSEMBLIES

Through 40 years of gear making, these are the 10 gear types that have emerged as our specialties.

If one (or more) of these types is included in your product, it may pay you to review the facts about Double Diamond Gears contained in this book.

We will be happy to send you a copy. Why not write for one today?



FOR AUTOMOTIVE, FARM EQUIPMENT
& GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

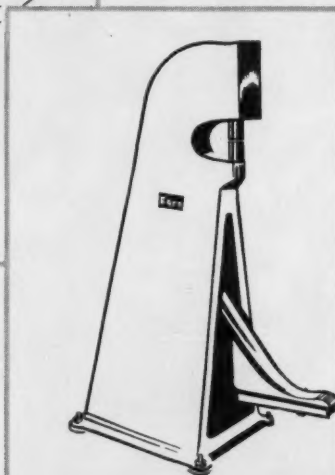
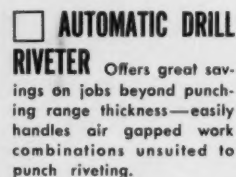
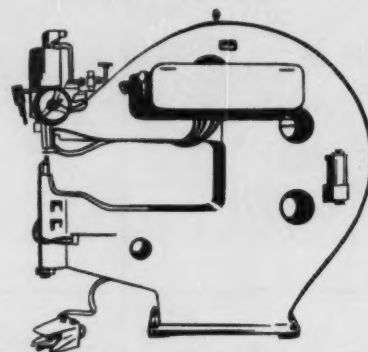
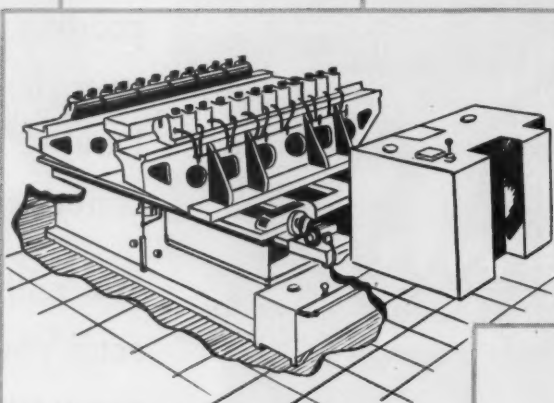
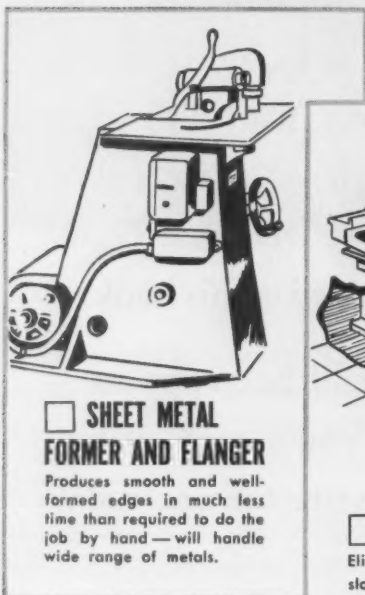
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ESTABLISHED IN 1914

RICHMOND, INDIANA

WHICH OF THESE ERCO machines FITS YOUR NEEDS?

Check the following—



**Cut costs . . . increase production in your plant
with **ERCO** equipment**

Machine tool design and production has been an ERCO specialty since its beginning days. The machine tools shown on this page are the result of a continuing search for improvement . . . to provide industry with faster, more accurate, less costly production.

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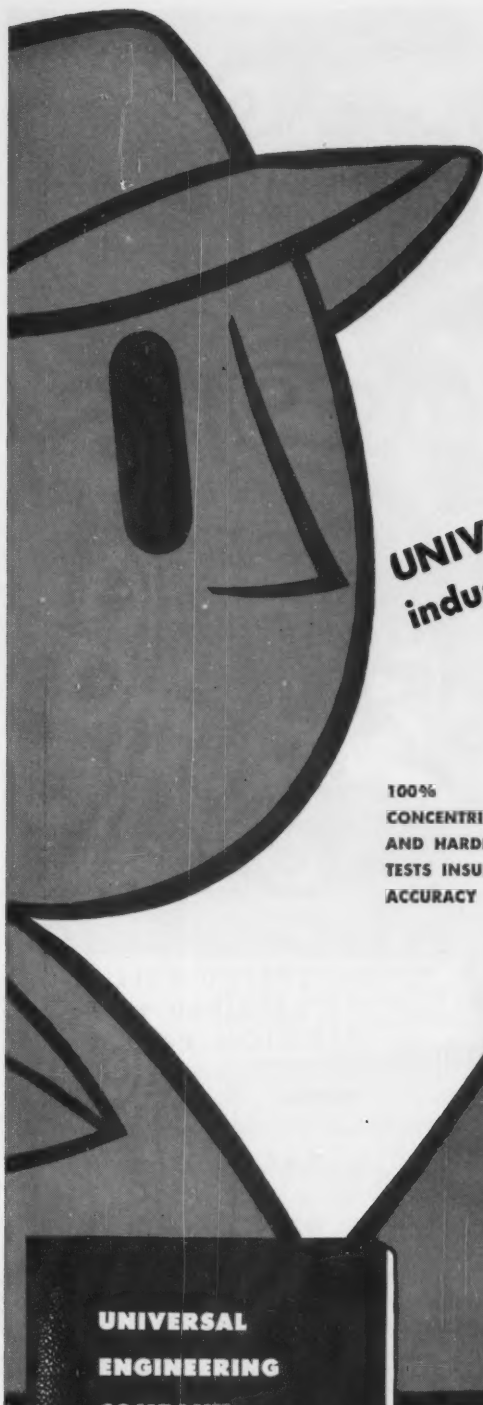
Please send additional information about the machinery checked above to:

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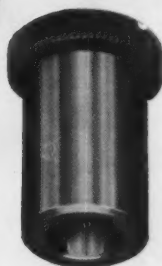
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A DIVISION OF **ACF INDUSTRIES**
INCORPORATED

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TOOL WEAR**

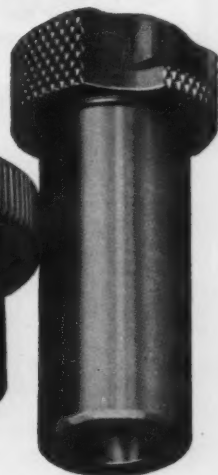
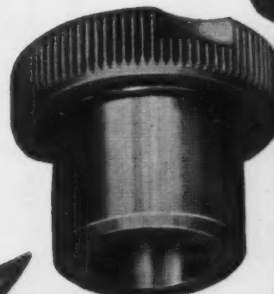
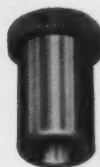


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PROVIDE
GOOD GRIP**



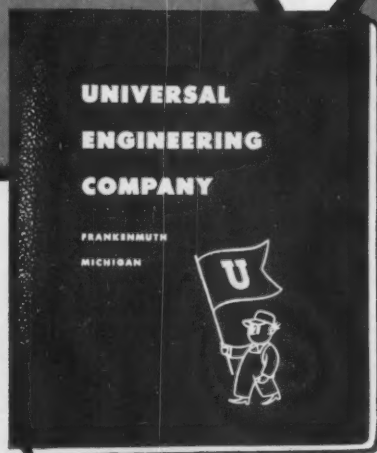
UNIVERSAL DRILL BUSHINGS
industry's standard of quality and service

**100%
CONCENTRICITY
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TESTS INSURE
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**BLENDED
RADIUS
HELPS PREVENT
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Universal Drill Bushings are available in a complete range of standard sizes and lengths. Special sizes made to order. Vastly increased production facilities assure immediate deliveries. Write to the office nearest you, Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.



Universal products include:

Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, "Kwik-Switch" Tool Holders, Mikro-Lok Boring Bars, Standard Drill Bushings, and Universal Index Plungers. Write for catalog.



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UNIVERSAL ENGINEERING COMPANY

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Roll **THOSE THREADS** for **STRENGTH, ACCURACY** and Overall **ECONOMY** on the **Precision-Rol**

EXCLUSIVE ADVANTAGES

- Just one adjustment for precision matching of rolls
- Just two adjustments to precisely set pitch diameter

The Sheffield-Murhey Precision-Rol attachment mounted on your automatic screw machine or turret lathe, rolls high precision, close tolerance uniform threads, right or left hand, at mass production rates. Annular or helical grooves, taper threads and non-uniform starts can be produced—also knurling and burnishing.

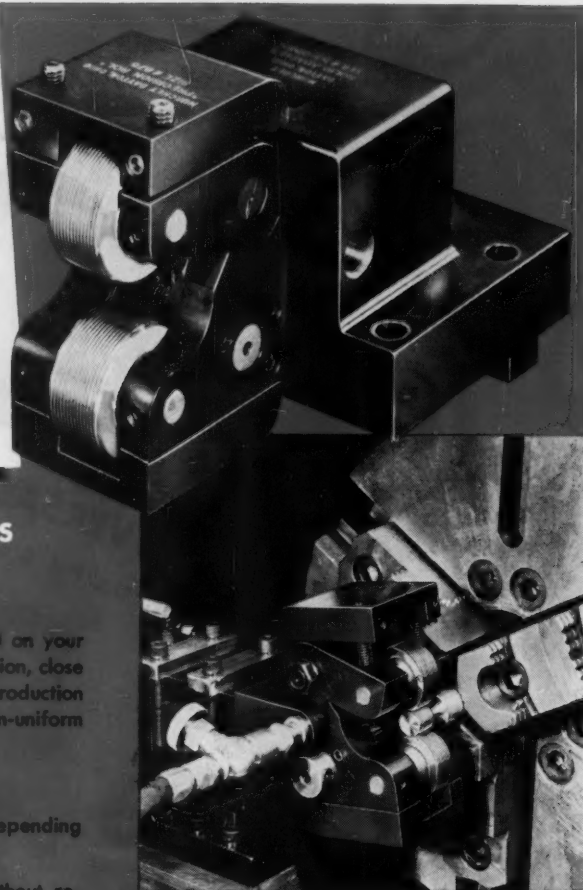
GEARING—All gearing **TOTALLY ENCLOSED**

ROLL LIFE—In excess of 100,000 work pieces, depending on material rolled—some jobs as high as 350,000


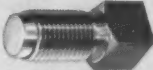


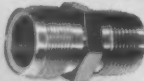
ROLL TIMING—Timing and adjustment of rolls without removal from the machine

Precision-Rol produces smooth finish threads with accurate lead.

Write for Bulletin MU-PR454. *Murhey Division, The Sheffield Corporation, Dayton 1, Ohio, U.S.A.*



ACTUAL THREAD ROLLING CYCLES OBTAINED WITH PRECISION-ROL

PART	MATERIAL	THREAD	CYCLE TIME
 TUBE FITTING	Aluminum	$\frac{7}{16}$ —20 N.F.	3 Sec.
 LOCK SCREW	4140 Steel	$\frac{7}{16}$ —14 N.C.	5 Sec.
 TUBE FITTING	Brass	$\frac{7}{16}$ —20 N.F.	3 Sec.
 STOP SCREW	4140 Steel	$\frac{5}{16}$ —24 N.F.	5 Sec.
 SPARK PLUG	Steel	$\frac{3}{4}$ —20 N.F.	4 Sec.

See us at the
Machine Tool Show, Booth 1305



SHEFFIELD

MANUFACTURE AND MEASUREMENT FOR MARKING

CAPACITIES OF STANDARD UNITS*

Attachment Number	Thread Diameter	Roll Face
437	0 to $\frac{3}{4}$	$\frac{3}{4}$ in.
875	$\frac{3}{4}$ to $\frac{1}{2}$	$\frac{5}{8}$ in.
1125	$\frac{3}{4}$ to $1\frac{1}{4}$	1 in.
1500	$\frac{3}{4}$ to $1\frac{1}{2}$	1 in.

*Special units can be furnished and installed.

NOW

a high-speed Quenching Oil that gives all-purpose performance

**Here's why metal-working plants everywhere
are changing to Shell Voluta Oil 23**

1.

High cooling rate through the critical temperature range. To develop maximum physical properties, various carbon and low alloy steels require higher cooling rates than provided by conventional mineral type quenching oils. Shell Voluta Oil 23, because of its initial cooling rate, helps develop these desired properties in such steels.

2.

Versatility of Use. Shell Voluta Oil 23, because of its high cooling rate, helps to obtain uniform properties with any steel of variable hardenability. It works equally well at normal (120-150°F) oil temperatures and in hot-quenching operations with oil up to 250°F.

Quenching from cyanide into Shell Voluta Oil 23 gives exception-

ally clean part surfaces . . . often eliminates the need for after-quench cleaning.

The cooling rate of Shell Voluta Oil 23 is high through the critical range, while its rate of cooling during martensitic transformation is essentially that of conventional oil. This combination is ideal for minimizing distortion tendencies.

3.

Stability in Service. Extreme resistance to sludging and viscosity change has been achieved through the careful selection of well-refined base stocks and the use of special additives. Shell Voluta Oil 23 stays the same physically AND retains its high cooling rate. *Write for further details.*

SHELL OIL COMPANY

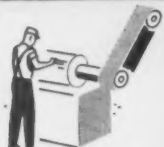
50 WEST 50TH STREET, NEW YORK 20, NEW YORK
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Down



MANUAL



SEMI-AUTOMATIC

the years

with



AUTOMATIC



SELF LOADING & UNLOADING

machine

tools

...and now the NEWEST

AUTOMOTION

MACHINES THAT THINK FOR THEMSELVES

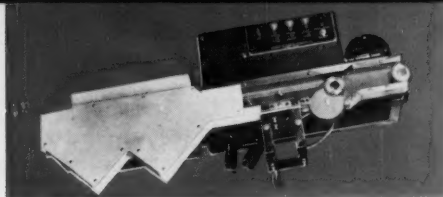


Moving ever forward in the development of new gear-hobbing methods, Lees-Bradner now presents a hobber that *electronically* corrects tolerances while the machine is in action.

The secret lies in an "electronic brain" that checks the finished gears as they come from the hobber and makes corrections as necessary in pitch diameters or root fillets by electrically shifting the hob between cycles.

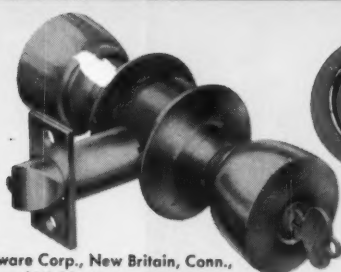
This is truly a revolutionary step forward in gear hobbing efficiency . . . time-saving as well as money saving.

If you, too, want to stop manufacturing "scrap" in your hobbing operations by catching off-tolerance pieces *before* they're hobbled, get the whole story from your Lees-Bradner representative. Or, write to us direct.



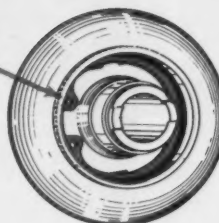
the **LEES-BRADNER**
CLEVELAND 11, OHIO • U.S.A.
Company

Waldes Truarc Retaining Rings Eliminate Machining— Provide Stronger Assembly, Greater Accuracy



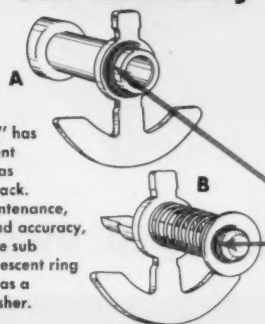
The American Hardware Corp., New Britain, Conn., uses 4 different types of Waldes Truarc Retaining Rings in the original design of these famous Corbin and Russwin Heavy Duty Cylindrical Locks. Truarc rings improve product performance, eliminate rejects, and cut labor costs.

Knob Sub Assembly



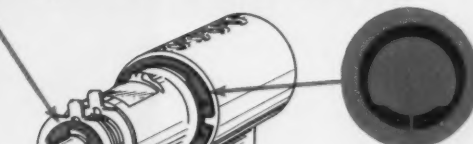
Truarc Beveled Ring (Series 5002) couples the knob to the knob shank. It eliminates two tapped holes and two screws, provides stronger assembly and greater accuracy. Beveled ring takes up end play rigidly.

Spindle Sub Assembly



Spindle sub assembly "A" has two Waldes Truarc crescent rings (Series 5103) used as locating flanges for rollback. This saves labor and maintenance, improves performance and accuracy, eliminates rejects. Spindle sub assembly "B" uses one crescent ring as a spring retainer and as a locating shoulder for washer.

Cylinder Sub Assembly



Knob unlocking mechanism uses one Truarc E-ring (Series 5133) as a spring retainer and one inverted ring (Series 5108) for retaining the cylinder plug. Rings are re-usable in the event of disassembly for maintenance. Rejects are eliminated.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product...to save you material, machining and labor costs. They're quick and easy to assemble and disassemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring.

36 functionally different types...as many as 97

different sizes within a type...5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U.S.A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!



Send for new catalog supplement
WALDES
TRUARC®
RETAINING RINGS

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which
brings Truarc Catalog RR 9-52 up to date.
(Please print)

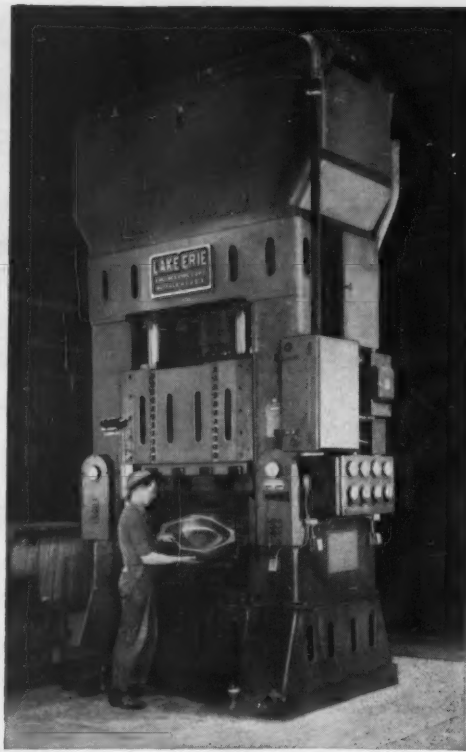
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Title _____
Company _____
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City _____ Zone _____ State _____

MO37

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.

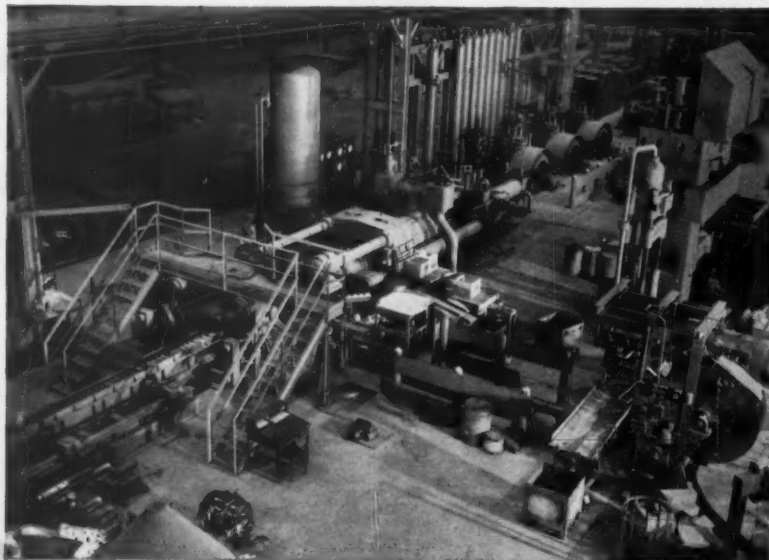
For more information on products advertised, use inquiry Card, page 245

MACHINERY, August, 1955—123

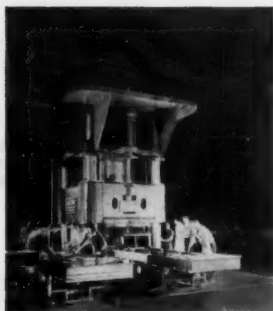


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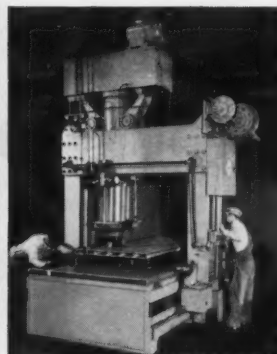
From a single press to a packaged installation . . .



PACKAGED INSTALLATIONS



RUBBER PAD FORMING



STRAIGHTENING



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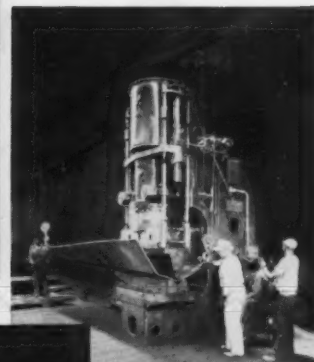
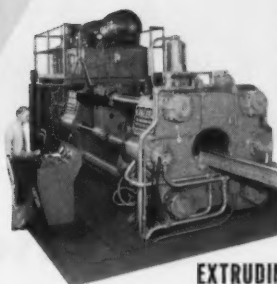


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LAKE ERIE MAKES THEM ALL

More than 3,500 developed designs of hydraulic presses to meet every pressing requirement are immediately available to you at Lake Erie. Make it a practice to consult Lake Erie about your hydraulic press needs.

(Leasing and deferred payment plans tailored to your exact needs.)



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HANDY
BUYER'S
GUIDE** ➔

PRESS		PRESS TYPES									
APPLICATIONS		1	2	3	4	5	6	7	8	9	10
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Comparison proves:

new IMPERIAL has:

Swing over ways

Swing over gap

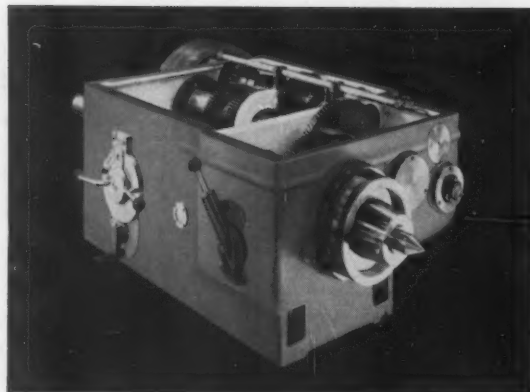
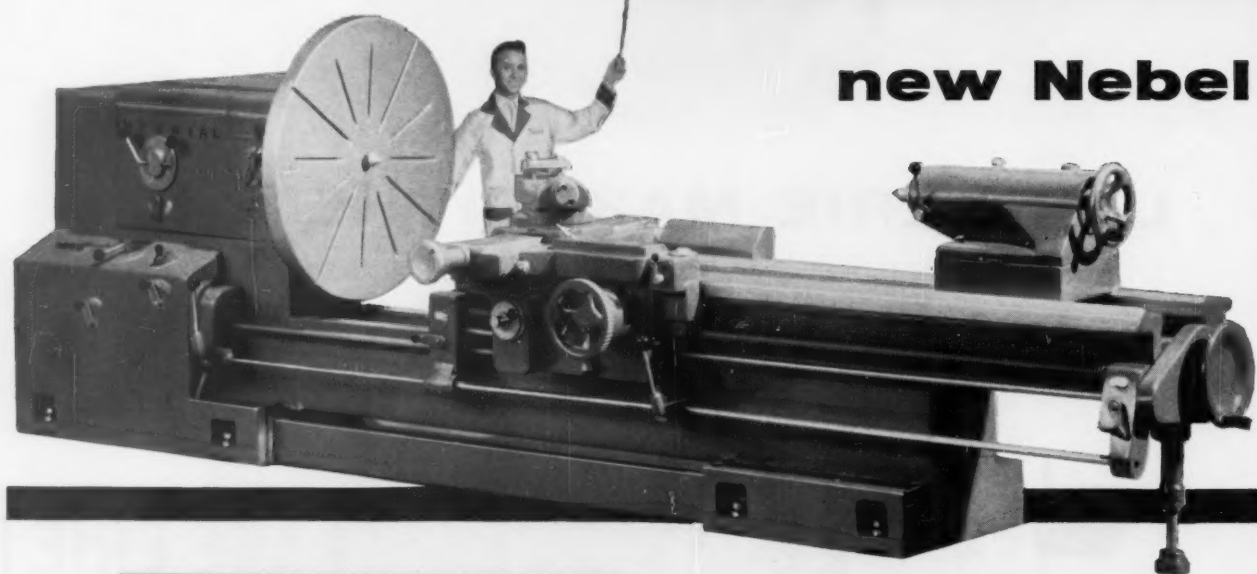
Spindle speeds, number

Spindle speeds, range, rpm

Main drive motor, hp

Weight, net, lbs.

new Nebel



IMPERIAL HEADSTOCK — powerful 18-speed dynamo of metal-cutting energy

Smartly engineered, perfectly balanced, the Imperial headstock delivers more power to the spindle. Husky shaved and hardened steel gears are mounted on short, splined shafts. All shafts run on anti-friction bearings including the 3-bearing spindle. An oil spray, automatically controlled, provides ample lubrication.

The Imperial offers 18 spindle speeds with a single speed motor, ranging from 11 to 666 rpm, or from 16 to 1000 rpm. With a 2-speed motor, 36 spindle speeds are available, ranging from 5 to 666 rpm, or from 8 to 1000 rpm.

plenty of CAPACITY - POWER - SPEED - Costs less

Imperial	Lathe Z
24 1/2"	20 1/2"
42"	41 3/4"
18 (36 with 2-speed motor)	24
11-666	11-673
10-20	10-15
8100	8200

IMPERIAL biggest value in extension bed gap lathes

Before you buy your next extension bed gap lathe, check the new Nebel 20"/40" Imperial. Compare it with *any other* lathe of its kind. You'll find:

(1) The new Imperial costs less—several hundred dollars less—than its nearest competitor, yet has fully as much capacity, power and weight.

(2) Imperial offers a new experience in operating ease, efficiency and economy.

For complete information on the first really all new extension bed gap lathe introduced in the last 10 years, write today for descriptive free bulletin. Nebel Machine Tool Corp., Cincinnati 25, Ohio, U. S. A.



SEE THE NEW IMPERIAL AT THE SHOW!

Be sure to see the new Imperial—and other Nebel gap and engine lathes—in action in Nebel booth 511 at the Machine Tool Show, International Amphitheatre, Chicago, September 6-17.



At the Show...

**See
Stainless Bored
at Better than
7" per Minute!**

*on the New LeBlond-Carlstedt
Rapid Borer*



With the new LeBlond-Carlstedt Rapid Borer, you can bore, trepan or counter-bore holes 3 to 8 times faster than by the conventional D-bit method! We'll prove this at the Machine Tool Show. You'll see a 1½" hole bored in solid Stainless 303 at better than 7" per minute. We'll bore 4140, C-1141 and 6150 even faster!

The Rapid Borer was developed expressly to accommodate revolutionary new tooling which cuts at very high speed with excellent accuracy and finish. Cutting oil is forced between the boring bar and hole wall forming a continuous bearing. It flushes back through a hole in the boring head and bar, carrying away the chips as it goes. Chip form is controlled both by tool angles and proper feed and speed combinations; thus tool faces are kept clean and chip passage clear. Cutter design produces balanced cutting pressures thereby controlling concentricity.

This new tooling requires a machine with the following characteristics, all of which are incorporated in the Rapid Borer's design:

High spindle horsepower

Ample rigidity throughout

Complete absence of vibration at all speeds

Infinitely-variable feeds (up to 38" per minute), independent of speeds, while running under load

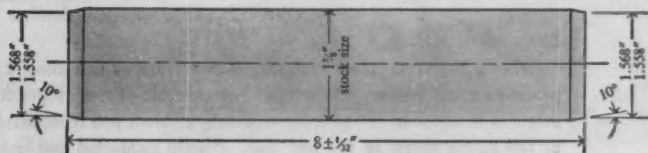
Final drive to spindle through belts

Large volume of cutting oil

Basically, the Rapid Borer is suited to work that is symmetrical for balance in rotation—round, square, octagonal, tapered or stepped. A wide variety of hole diameters and depths as well as work sizes can be accommodated.

Tell us about the holes you'd like to produce faster. Large holes or small. If the Rapid Borer can handle the job, we'll show you how to produce them faster than ever before.

Like to see your own materials bored at the show?



Just prepare sample bars of the materials you are now boring, or intend to bore. Make them according to the drawing here. Bring them to the Show and we'll bore them for you on the Rapid Borer.



See it at the show. No. 1313—dead center of the new exhibition hall.

...cut with confidence

The R.K. LeBlond Machine Tool Company

Cincinnati 8, Ohio

*World's largest builder of
a complete line of lathes for
more than 68 years*



Here's Your Best Assurance of

Higher Output
Better Accuracy
Reduced Costs

On Every Boring
and Facing
Operation



**ONLY DAVIS
GIVES YOU ALL**

8 OF THESE ADVANTAGES

1. Block centers accurately in bar.
2. Full thrust transmitted to bar.
3. Readily adjusts to float boring.
4. Cutters rigidly locked in block.
5. Assure maximum range of bore sizes.
6. Blocks feature built-in centers.
7. Fore or back bore with one tool.
8. Quick, easy changing of blocks.

FOR COMPLETE INFORMATION,
WRITE FOR DAVIS CATALOG 304

With only two items to handle
—block and taper lock
screw—it takes but a few
seconds to insert a Davis block
in its bar and start boring.

*All 4 Block Styles Fit
into the Same Bar Slot*

Every boring job in your shop goes faster, more accurately and shows up far better on cost records when you standardize on Davis block tooling.

Truer bores result from exclusive design features and simplified, precision construction. The unique Davis double-piloted, taper lock screw is unequalled for accurate centering of block and transmission of full boring thrust to the bar slot. Rigidly supported and locked cutters assure higher accuracy on even heaviest cuts.

Faster, more economical boring results from the complete interchangeability of the Davis block line. Four basic block styles can be used in any particular bar slot—and changing blocks is simpler and faster than any other method. Bring your boring operations up to date—write now for complete information on how Davis Interchangeable Block Tooling can save you time, money and rejects.

DAVIS

BORING TOOL DIVISION OF
Giddings & Lewis Machine Tool Co.
Fond du Lac, Wisconsin



THE ONE NAME THAT CERTIFIES ULTIMATE PRECISION AND PRODUCTIVITY IN TOOLING

POTTER & JOHNSTON

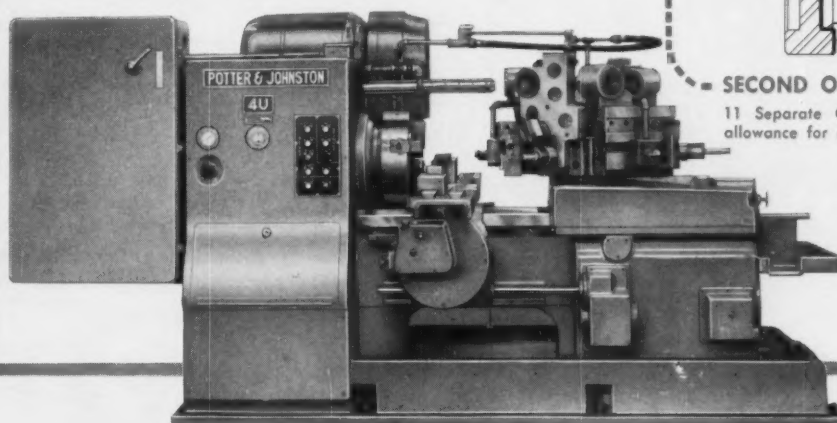
4-U AUTOMATIC TURRET LATHE

Handles **TOUGH STEEL FORGINGS**

Quickly . . . Economically

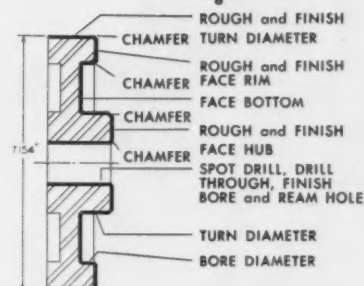
Jobs like machining this change gear blank, forged from 6150 steel, including boring the 1 1/8" hole *from the solid*, are easy, fast, profitable. That's because the P&J 4-U is a *modern* machine with the advanced design, added rigidity, and extra speed and power to take today's tough steels in stride.

**WITH TOOLING
ENGINEERED BY P & J EXPERTS**



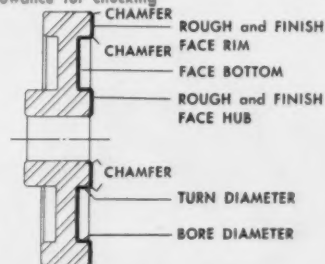
SEE US AT SPACE 1219

THE
MACHINE TOOL
SHOW
CHICAGO, ILL.
SEPT. 8-17, 1955
INTERNATIONAL AMPHITHEATRE



FIRST OPERATION

17 Separate Cuts, 3.41 minutes including allowance for chucking



SECOND OPERATION

11 Separate Cuts, 2.56 minutes including allowance for chucking



TAKE ADVANTAGE OF DIRECT-FACTORY SERVICE

To serve you best, all P&J Automatics are made available to you through Potter & Johnston and Pratt & Whitney direct-factory Representatives. For full information on the 4-U and other P&J Automatics . . . plus expert application engineering . . . phone or write the P&W Branch Office conveniently near you.

POTTER & JOHNSTON Co.
PAWTUCKET, RHODE ISLAND

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SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., PAWTUCKET, RHODE ISLAND
AGENTS: DALLAS, THE STANCO CO. • HOUSTON, WESSENDORFF, NELMS & CO.

PRECISION PRODUCTION TOOLING



FOR MORE THAN FIFTY YEARS

For more information on products advertised, use inquiry Card, page 245

MACHINERY, August, 1955—131

NO down



*Photos courtesy Century Machine Company,
4434 Marburg Avenue, Cincinnati 9, Ohio*

time in **16** years...

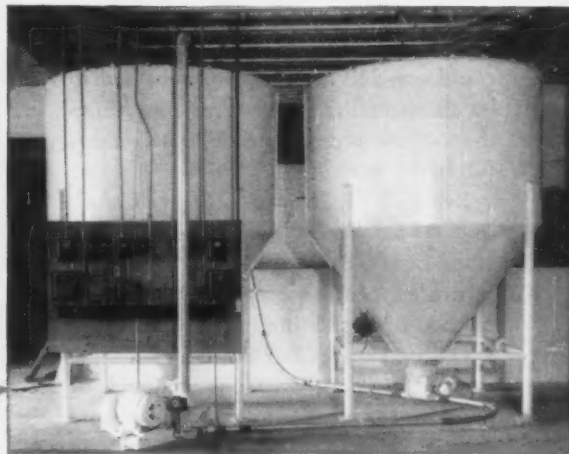


SEE
CINCINNATI
SHAPERS, SHEARS,
PRESS BRAKES
BOOTH 1105

The records of the Century Machine Company show "no down time in sixteen years use" on this Cincinnati Press Brake.

This machine, working a 9½ hour day, forms light gauge sheets in mild and stainless steel up to ¼" thickness. It is constantly producing accurate parts for easy assembly of Century's baking ovens and bakery machinery.

Write for New Press Brake Catalog B-4 describing Cincinnati Interlocking All-Steel construction, Center-line Loading, deep rigid beds and rams.



● Flour Storage Bins—each 1000 lbs. capacity

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

SHAPERS • SHEARS • BRAKES



HOW WE QUADRUPLUED TOOL LIFE—and cut tool cost 75%

—as told by George Edgar,
Foreman, D. O. James Gear
Mfg. Co., Chicago, Ill.

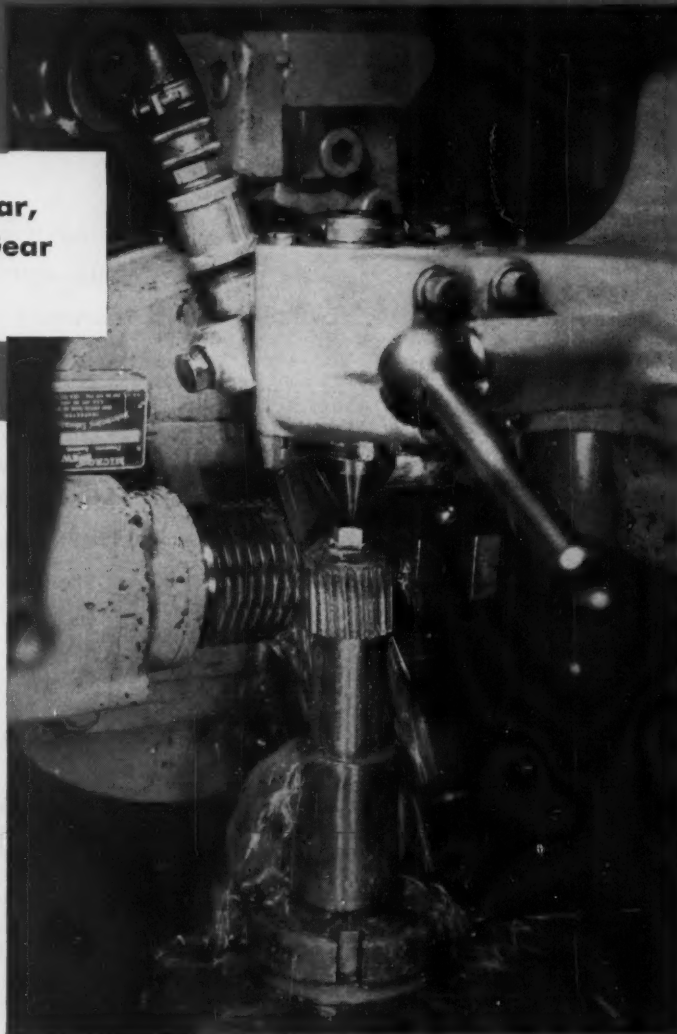
"**THE JOB** was hobbing a small helical gear," says Mr. Edgar. "With the cutting oil we have been using we averaged about 125 gears between resharpenings after using the full face of the hob."

"A Texaco Lubrication Engineer offered to help us do better. On his recommendation, we changed to *Texaco Transultex Cutting Oil B* and found we could run 500 gears before hobs had to be sharpened. This gave us four times the tool life and cut our tool costs on this job by 75 per cent."

Everywhere, *Texaco Cutting, Grinding and Soluble Oils* are helping to machine faster, better and at lower cost—regardless of the metal being cut or the method of machining it.

Let a Texaco Lubrication Engineer help you gain these benefits for your plant. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



JOB DATA

Steel	AISI 4140	No. of teeth	19
Hardness	Rc 30-35	Diam. Pitch	12.037
Diameter	1.75"	Hob Diam.	3.50
Face	0.75"	RPM	110
Shape	Helical	Feed	0.070"

SFPM 101



TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

TUNE IN... TEXACO STAR THEATER starring JIMMY DURANTE or DONALD O'CONNOR on television... Saturday nights, NBC.



By LORING F. OVERMAN

Economy at New High, and Defense Budget Increased

FROM most of the angles that count, the outlook for machinery industries is extremely favorable. Worthy of a second look are the following: a \$31,800,000,000 defense budget; an optimistic June report of the Council of Economic Advisers; and strike settlements easing business tension but forecasting further automation.

Defense Budget Increase

At press time for this column the House had passed and the Senate Armed Services Committee had recommended for passage a whopping budget for defense. \$356,000,000 in funds being added for the Air Force, and \$380,000,000 restored after a House cut, the measure was ready for a Senate vote to provide \$31,800,000,000 in new funds for defense.

Arguments favoring the more than \$700,000,000 increase in Air Force funds placed considerable stress on recent reports of Russian air power. Funds provided for the USAF in the bill would increase by more than one-third the new equipment for heavy bomber and reconnaissance planes, and would place the Air Force at its most effective level.

As a part of the defense program, the Armed Forces were directed to submit by June 29 a list of new machine tools and production equipment which they propose to purchase for mobilization reserves out of a \$100,000,000 fund established by the Defense Department for fiscal 1956. The order to submit lists by June 29 was contained in Defense Department Instruction No. 4005.10. In an earlier listing of defense needs, the Air Force was allocated \$84,500,000, the Navy \$14,500,000, and the Army \$1,000,000. Little of this fund has been spent.

The call for new proposed projects, according to the directive, specifies that "only machine tools and production equipment required during the first year of mobilization, and having a manufacturing cycle time of six months or more, shall be included in the listing." The directive also points out that the items needed are general-purpose tools which can be modified by a change of fixtures. Items proposed are intended to be adaptable for machining future designs now being developed, as well as for military items of present design.

In addition to tools for the mobilization base, two other machine tool programs are in the works in Washington. One involves special machine tools for current use—such as the heavy press program; and the other, a long-range plan proposed by the Navy Bureau of Ships to replace some \$150,000,000 in tools and production equipment in Naval shipyards. The Army and Air Force have also been briefed on the idea of an over-all long-range modernization program. The object would be to replace equipment on an as-needed basis, avoiding overloading of obsolete equipment in case of an emergency.

Meanwhile, the much-discussed heavy press program came in for some recent controversy on the floor of the House. Representative Daniel Flood (D-Pa), a member of the House Appropriations Committee, was critical of Administration cuts in the over-all program. He commented that the Appropriations Committee voted five years ago for an Air Force heavy press program at a cost of \$389,000,000, but that the Republicans had cut the program back. Said Mr. Flood: "They sacrificed half the production capacity of the heavy presses in the program and saved only 20 per cent of its original cost." He commented that Russian heavy presses may very well be the answer to Russia's superiority in the air.

Another Air Force spokesman has a different idea concerning the way to keep pace with potential enemies. He is Lieutenant General Donald L. Putt, Deputy Air Force Chief of Staff for Development. "We Americans," he said, "are great at the application of fundamental knowledge to develop useful things and to produce them in great quantities. Conversely, it is sobering to reflect that much of the basic research and knowledge which forms the basis of our many marvels of invention today—nuclear power and weapons; radar, jet, and rocket propulsion; and others—came from foreign lands. It seems to me that our two most important deficiencies are an inadequate basic research program and an inadequate supply of scientists and engineers."

As evidence of the need for a long-range program, General Putt stated that in the last fifty years, the proportion of high school stu-

dents studying algebra has dropped from 50 per cent to 20 per cent; and those studying physics from 20 per cent to 4 per cent.

Economic Outlook

The June report of the President's Council of Economic Advisers, covering May changes, indicates that the economy is now operating at the highest rate in history. Industrial production, increasing each month for eight consecutive months, topped the previous high reached in mid-1953.

Of particular interest to the machinery industries is the gain in expenditures for new plant and equipment. A forecast by the Council of Economic Advisers is that expenditures for new plant and equipment during the full second quarter of 1955 would be 9 per cent above the first quarter—the largest quarterly rise since the last half of 1950. Currently announced plans for further expansion indicate an additional rise of 3 per cent in the third quarter, to a level of \$29,000,000,000—equaling the previous peak reached in the third quarter of 1953.

Labor Influences

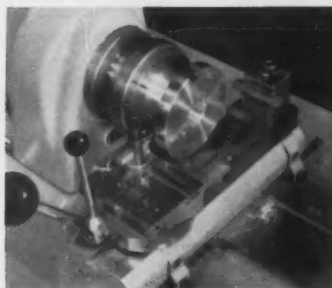
Labor folks in Washington—and there are now forty-five headquarters of national labor organizations in the Capital City—find much food for thought in the recent settlement of Ford and General Motors contracts on a guaranteed annual wage idea.

The new contracts are considered a labor victory in principle, but only time will tell whether it will mean money in labor's pocket. Meanwhile, analysts seem quite sure that production costs will rise in automobiles and heavy consumer items, but that competition is so keen that few of these added costs will be passed along to buyers. This means, they say, good news for the machine tool and automation people. The only answer to increased labor costs may be to increase the output of production lines through automation.

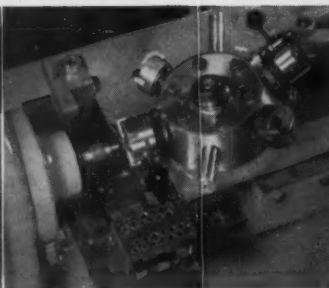
Typical of the changes which may come in other lines is the experience of one television producer. In 1946 each of its production lines required about 125 workers to hand-assemble, hand-wire, and hand-solder television assemblies. In 1956, machines will do the entire job, with about forty persons per assembly line.

HARDINGE
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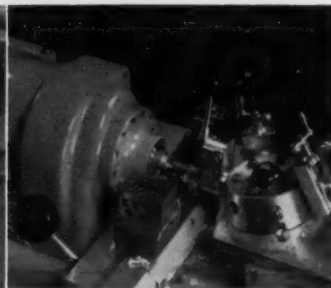
NEW Variable Speed Machine for **PRODUCTION DEPARTMENTS**



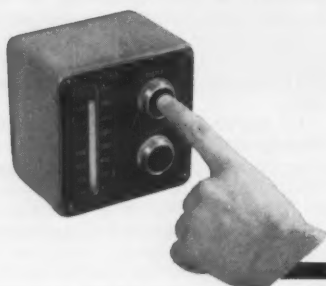
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The Shows are Coming Fast!

THE machine tool builders the country over have been assiduously applying their inventive genius in recent months to develop manufacturing equipment that will be exhibited at the coming Show. Their labors along that line have now been completed and the machines have already been delivered at the Chicago Amphitheatre and placed in the respective booths.

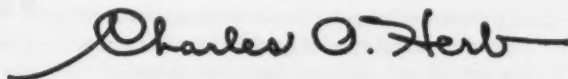
This was no mean job since many machines weigh as much as 25,000 pounds apiece. The machines are being readied for the approval of the thousands of production men and other industrial executives who will converge on the Windy City next month.

Those few who have had the privilege of previewing some of the machines to be presented for the first time to the metal-working industry have expressed their astonishment and gratification at the many novel but practical ideas that have been incorporated in new designs. Ingenious control devices, simplified construction, and new types of machines, all designed for higher work quality at lower cost, will be evident throughout the exhibition hall.

Eight years have elapsed since the last Machine Tool Show. The coming event will give the users of machine tools the opportunity to see firsthand and in actual operation the production equipment that has been brought out to keep America in the forefront as an industrial nation. Unprecedented attendance is predicted for the Show—few production men can afford to miss it.

Similarly to the machine tool builders, the exhibitors of the Shows that will run simultaneously at the Navy Pier and Coliseum will present the latest developments in cutting tools, gaging devices, machines, and accessories essential to the economical operation of metal-working plants. An infinite variety of equipment will be on display.

September MACHINERY will constitute a preview of the three shows. By illustrating and describing a multitude of new developments, this issue will enable prospective visitors to plan their itineraries at the different exhibitions. It will also serve as a directory of the latest types of metal-working equipment and will be useful to production and purchasing executives for several years.



EDITOR

Let's take a



new look

at quality control

One of the great ideas in steel supply has been taking on new meaning at Ryerson lately—and it will be worth your while to learn about it.

Twenty years ago, the Ryerson plan for Certified Steel was big news because it set standards of quality unequalled in steel from stock at that time. But during the postwar period of great demand, emphasis on quality necessarily gave way a little to emphasis on quantity until additional capacity could be built.

Today, however, there's no compromise! A committee of top Ryerson executives has instituted a sweeping new program of checks and counter-checks. Specifications have been rewritten; inspection techniques tightened; so that today *Certified Steel* means more than ever before. For example, it means that:

- every kind of steel in Ryerson stocks—carbon steel, alloy steel and stainless—is produced to definite specifications for high uniform quality.

- you are protected against the possibility of mixed steels by our spark testing of carbon steel plates and special quality bars, structurals, alloys and stainless bars and plates.

- the specific heat analysis is available for all Ryerson plate steel, special quality carbon bar steel, alloy steel and stainless steel because all are identified by heat number and every heat analysis is kept on file.

- you can use Ryerson alloy steel with complete confidence because a practical 8-step quality-control plan assures dependable performance and guides heat treatment.

- on *all* Ryerson Certified Steels we are able to furnish a certificate of analysis.

Certified Steel means all these things and many more. Its essence is a devotion to quality that has an increasing dollars-and-cents importance to you. The world's largest steel stocks are also the world's finest—backed by over a century of reliability in product and service. Today, more than ever before, you can depend on Ryerson as your best source for the steel you need, when you need it.

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HOW TO CONTROL PERISHABLE TOOLS



A "Manual of Perishable Tool Control Practices" has been prepared by the Ford Motor Co. as a guide for the establishment of practices and methods necessary to achieve optimum tool efficiency and to avoid waste

By **GEORGE PASCOE**, Manager
Design and Standards Department
Manufacturing Engineering Office
Ford Motor Co., Dearborn, Mich.

MAXIMUM efficiency of cutting tools and minimum costs per work-piece should be primary objectives of any metal-working plant. To achieve these results, the Ford Motor Co., has prepared a "Manual of Perishable Tool Control Practices." This manual describes practices pertaining to all phases of tool application which affect over-all tool economy.

Recommendations included in the manual serve as a guide for the establishment of practices and methods. Although written chiefly for cutting tools, most of the principles may be

adopted for all types of perishable tools used in machine shops.

The tools required to manufacture a particular part are indicated or specified during the processing stage and are based upon the permissible cycle time; the form, type, and condition of the material from which the part is to be made; and production requirements. To achieve quality and economy of production, many factors pertaining to tooling are considered at the processing stage.

For example, the design of the part is analyzed relative to its effects on tooling and manufacturing processes. Any desirable engineering changes are requested when necessary. The form and type of rough stock are studied to determine clamping and locating points, amount of stock removal, dimensional requirements, surfaces to be machined, sequence of operations, and other pertinent factors. Also, the cycle time of each operation is determined, taking into consideration the time required for loading and unloading, approach and return of the spindles, machine

indexing, and actual machining. The machinability of the material is important as a guide in the selection of optimum speeds and feeds. Hourly and daily production requirements and anticipated model life of the product have an important bearing on the selection of tools.

Standard tools are specified whenever practicable. The process engineers familiarize themselves with all available standards, especially Ford tool standards which cover all basic tools used in manufacturing operations. With the application of standard tools, the benefits derived from quantity buying, minimum inventory, availability, interchangeability, safety, and minimum down time for maintenance can be achieved. When the requirements of the part are such that standard tools cannot be applied, either modified standard tools or commercial tools are the next choice. Special tools are specified only when standard or commercial ones cannot adequately do the job.

Process sheets are prepared only after the foregoing considerations regarding tooling have

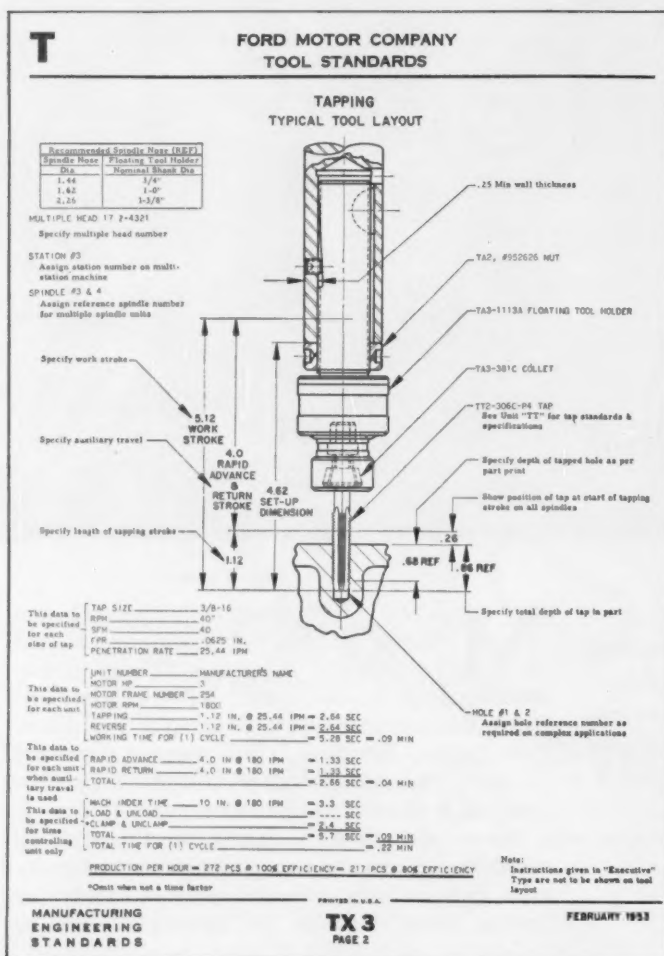


Fig. 1. Typical tool lay-out provided in Ford Manufacturing Standards Books serves as a guide in preparing tool layouts for various jobs. This drawing for tapping operations specifies data to be included for each size tap and tapping unit.

Fig. 2. Tool-control boards hold several sets of pre-set tools, various setting gages, and Toolometers which automatically keep track of the number of parts produced.



been made. The process sheets contain a complete description of the operation and of the equipment and tools to be used. A Tool Analysis Activity is employed at Ford to review the tools indicated on the process sheet and resolve any tooling difficulties with the Process Activity at this stage. Necessary documents are also prepared at this time for procurement of equipment and tooling.

Tool Lay-Outs and Drawings

The purposes of the tool lay-outs are to determine, show, and serve as a permanent record of the type and design of all tools, adapters, guides, and holders required for a certain operation; their relative positions; the requirements of the driving units; the machine work cycle; speeds and feeds; and related requirements. Typical tool lay-out drawings, such as the one shown in Fig. 1, are included in the Ford Manufacturing Standards Books, and used for reference in preparing lay-outs for a particular job.

Tool lay-outs show:

1. The construction and relative position of all tools, tool-holders, drivers, adapters, and tool guides;
2. Tool or work travel, speeds and feeds, and machine cycle data;
3. Pertinent dimensions, outline, and shape of the work-piece and work-holding device; and
4. Related pertinent information.

Tool lay-outs are checked for practicability and completeness. Some of the factors checked by the designated Tool Analysis Group in conjunction with the Process Activity include:

1. Speeds, feeds, and machine cycle;
2. Use of standard tools, holders, and guides;
3. General design of special tools, holders, and guides;
4. Ease of regrinding or reconditioning tools;
5. Provisions for rapidity and safety in changing tools, and feasibility of using pre-set tools;
6. Clearance for passage and disposal of chips;
7. Provision for use of coolants where needed; and
8. Conformance to related requirements regarding tool lay-outs.

Also, the cycle time of the controlling operation or station is analyzed for the possibility of reduction or improvement on those operations which are performed in automatic sequence. Pertinent changes and improvements are requested; questions pertaining to the tool lay-outs are resolved with the activities affected; and required approval is obtained.

The shape, dimensions, accuracy, strength, rigidity, construction, surface finish, material, and heat-treatment of a tool are determined at the tool design stage. Tool drawings are not made until the tool lay-out has been approved. Drawings are never prepared or special tool

numbers assigned for standard tools. The standard tool identification given on the tool lay-out is sufficient. In modifying a standard tool, only the modification is noted, and reference is made to the standard tool for other dimensions. When special tools are to be designed, an assembly drawing is prepared if necessary to show the characteristics of the tool and the relation between the tool and accessories. Detail drawings of special tools show both the shape and dimensions of the tool.

Appropriate tolerances are given on the detail drawings to obtain the required accuracy, but unnecessarily close tolerances that would increase the cost of the tool are avoided. All tool lay-outs and drawings are maintained on a current basis, and necessary revisions made according to applicable procedures. Prompt distribution of such revisions to all activities concerned is essential. Applicable specifications are prepared for procurement.

Information for Procurement

To assure availability of the proper tools in sufficient quantity for production, the Manufacturing Engineering Activity at Ford informs the

Stores or the Purchasing Activity of the anticipated requirements as soon as they can be determined. Information supplied for procurement includes a general description, and specifications or prints of each tool and its application. This permits the early establishment of adequate records for purposes of procurement, receiving, storing, and disbursement.

Also, the requirements for the first ninety days of production are specified. In those cases where the initial tooling is procured with the equipment, three sets of such tooling are normally procured. This amount may vary according to the requirements of particular applications. If during development it is found that revisions of the tool design or anticipated quantitative requirements must be made, Manufacturing Engineering notifies the affected Activities immediately.

Either the Stores or Purchasing Activity is notified of the monthly requirements for normal production as soon as possible. Notification of changes in quantity requirements due to changes in production schedule are made by the Production Activity. Suitable records are established and maintained for the following:

1. Original specifications, quantity requirements, and usage;
2. Revisions in specifications, quantity requirements, and usage;
3. Obsolescence; and
4. Salvage.

An adequate percentage of new tools are inspected. In the heading illustration, an inspector is seen checking face run-out on an inserted-blade face-milling cutter using a special cutter-inspection fixture on which the tool is mounted. On this cutter, face run-out is held to within 0.0005 inch by means of the comparator. The inspection may include dimensional accuracy, form, hardness, material, and surface finish, when applicable.

Tool inventories are maintained at the required levels according to established inventory procedures. Adherence to these procedures prevents excessive or insufficient inventories. Close coordination is maintained between the Stores, Production, and Manufacturing Engineering Activities to insure that all information regarding revision or obsolescence of inventory tooling is furnished immediately. Suitable procedures have been adopted to minimize the cost of tool



Fig. 3. A continuous, ample flow of coolant during tool grinding is one method of keeping heat at a minimum and avoiding damage to the tool.

DATE _____	FORD MOTOR COMPANY EVALUATION OF TOOL PERFORMANCE TOOL PERFORMANCE RECORD	TOOL NO. _____ (PLANT) TEST NO. _____		
TOOL NAME, DESCRIPTION _____		OPERATION _____		
PART NAME, NO. _____		OPERATION NO. _____		
MACHINE NAME, NO. _____		COOLANT, RATIO _____		
DEPTH OF CUT _____ SPEED _____ RPM _____ SPIN _____ FEED _____ PER TOOTH _____ PER REV _____ IN. PER MIN. _____				
TOOL IDENTIFICATION	PRESENT TOOL (A)	VENDOR (B)	VENDOR (C)	VENDOR (D)
NUMBER OF PRICES PER GRIND				
RAUNGE OF WEAR LANDS				
AVERAGE SIZE OF WEAR LANDS				
NUMBER OF TOOLS TESTED				
NUMBER OF CHIPPED OR BROKEN TOOLS				
AVERAGE NUMBER OF PRICES PER GRIND				
TOTAL REGRINDS PER TOOL (ACTUAL/EST.)				
MINUTES PER REGRIND (INCL. RESET)				
MIN. PER TOOL CHANGE, SET-UP, ADJUSTMENT				

MACHINERY, August, 1955—143

FORD MOTOR COMPANY
EVALUATION OF TOOL PERFORMANCE
TOOL COST ANALYSIS

TOOL NO. _____
 (PLANT) TEST NO. _____
 DATE STARTED _____
 DATE COMPLETED _____

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PLANT _____	DEPT. _____	HOURLY PROD. AT 60% EFF. _____	PCS. _____
TOOL NAME, DESCRIPTION _____		MONTHLY SCHEDULE _____ PCS.	
PART NAME, NO. _____		HARDNESS SPEC. _____	
MATERIAL (INO., TYPE) _____		COOLANT, RATIO _____	
MACHINE NAME, NO. _____		ROUGH CUT <input type="checkbox"/> FINISH CUT <input type="checkbox"/>	
REASON FOR TEST _____		DEPTH OF CUT _____	
SPEED: _____ RPM _____ SFM		FEED: _____ PER TOOTH _____ PER REV. _____ IN. PER MIN.	

SOURCE OF TOOL	PRESENT TOOL (A)	VENDOR (B)	VENDOR (C)	VENDOR (D)
TOOL MATERIAL (GRADE, TYPE)				
NAME OF PIECES PER GRIND				
NAME OF WEAR LANDS				
NO. OF TOOLS TESTED				
NO. OF CHIPPED OR BROKEN TOOLS				

(1) AVG. NO. OF PIECES PER GRIND	(2) TOTAL REGRINDS PER TOOL (ACTUAL/EST.)	(3) TOTAL RUNS PER TOOL (ACTUAL/EST.)	(4) TOTAL PIECES PER TOOL (1) x (3)	(5) NO. OF TOOLS REQUIRED MONTHLY (MONTHLY SCHEDULE) ÷ (4)
(6) MINUTES PER GRIND (INCL. RESET)	(7) MINUTES PER TOOL CHANGE, SET-UP, ADJUSTMENT	(8) TOTAL SET-UP TIME PER TOOL (3) x (7)	(9) MONTHLY MACHINE IDLE TIME DUE TO CHANGING TOOLS (8) x (5) ÷ 60 HRS.	

(10) PRICE OF TOOL (EQUAL QUANTITIES)	(11) COST PER GRIND (8) x \$ PER MINUTE	(12) COST PER TOOL CHANGE (7) x \$ PER MINUTE	(13) TOTAL REGRINDING COST PER TOOL (2) x (11)	(14) TOTAL SET-UP COST PER TOOL (3) x (12)
(15) TOTAL COST OF TOOL (10) ÷ (13) ÷ (14)	(16) TOTAL TOOL COST PER PIECE (15) ÷ (4)	(17) ESTIMATED MONTHLY TOOL COST (8) x (5)		

DISTRIBUTION

PURCHASING _____ 2

GENERAL STORES _____ 1

MFG. ENGS. DEPT. (PLANT) _____ 1

MFG. ENGS. DEPT. (DIVISION) _____ 1

MFG. ENGS. OFFICE (STAFF) _____ 1

DESIGN & STANDARDS DEPT. _____ 3

MFG. RESEARCH DEPT. _____ 1

OTHERS _____

METALLURGICAL ASPECTS OK _____

RECOMMENDATIONS AND REMARKS:

1ST PREFERENCE _____

2ND PREFERENCE _____

GEN. FOREMAN OR SUPT. _____

TOOL ANALYST (PLANT) _____

MFG., MFG. ENGS. DEPT. (PLANT) _____

WFS 6300
 AUG 52 3783
 SEE FORM 3783A FOR TOOL PERFORMANCE RECORD.
 SEE FORM 3783B FOR TESTING METHODS INSTRUCTION.

Fig. 5. Information on the Tool Performance Record card, shown in Fig. 4, is used by Tool Analyst to prepare this Tool Cost Analysis. Recommendations and remarks are given at lower right. This information is distributed to Purchasing, General Stores, Manufacturing Engineering, and others interested.

changing and adjusting be kept to a minimum. Where practicable, tool-holders and accessories are designed so that tools can be pre-set to the required length or size outside of the machine. The pre-set tools are placed on control boards, or as near the machine as practicable. In the illustration in Fig. 2, the operator is pre-setting a drill to the proper length by means of a set-up gage on the bench top of a tool-control board. The storage board, with tools in place, is seen in the background.

Examination of Used Tools

Many used tools are examined prior to reconditioning to detect abuses in the usage of tools. Such abuses as unusual breakage, chipping, or other abnormal conditions are usually detected by this examination. The kind and percentage of tools to be examined are based on the value of the tool, the quantity normally used, and the grinding time required.

Recommended examination practices include washing the tools to facilitate detection of abuses, and visual examination to detect the ab-

normal conditions. Visual aids and measuring instruments are used when required. Upon detection of abuses, factors such as usage, handling, change cycles, condition of equipment, general design of tools, and operating conditions are analyzed to determine the cause. Then, the appropriate Activity is notified of the trouble indicated so that corrective measures can be taken. Also, adequate records are maintained to provide a means of establishing tool usage costs, and to provide required data for the preparation of tool budgets.

Grinding Practices

The practices employed in tool grinding directly affect the quality and efficiency of a cutting tool, and, indirectly, the productivity of a machine tool. The quality of grinding directly affects tool life, the number broken or excessively worn during usage, and the quality of the work.

Principal requirements in regrinding cutting tools are to produce sharp, smooth, cutting edges; maintain original angles and form; and avoid conditions that would create weak or de-

fective cutting edges. To obtain the required quality, the considerations and practices here described are followed.

The first consideration is the tool material and its hardness. Hard or brittle material is more sensitive to grinding shock, and more susceptible to burns, cracks, and other surface defects, than softer and tougher materials. For instance, sintered carbide is the hardest and most brittle tool material normally encountered in production tools; it is, therefore, most important that all pertinent grinding practices be strictly adhered to when grinding this material. Silicon carbide wheels with vitrified bond are generally used. When a fine finish is required on carbide tools, diamond wheels with vitrified, resin, or metal bond are used.

Appropriate care is required when grinding cast-alloy tools, which may be both hard and brittle, and also with certain high-speed steel tools, which may have a hardness of the order of 66 Rockwell C. Aluminum oxide wheels with vitrified bond are normally used to grind high-speed steel and cast-alloy tools.

In grinding cutting tools, heat generation must be held to a minimum, and sharp, smooth cutting edges, free of defects, must be produced. The amount of heat generated can be held to a safe limit by keeping the area of contact between wheel and tool to a minimum, avoiding excessive rate of stock removal, avoiding excessive feeding pressures, and using grinding wheels of the proper hardness and related characteristics. Also, recommended surface speeds should not be exceeded, and a continuous and ample flow of coolant should be provided wherever applicable. A tungsten carbide-tipped broach blade, 5/8 inch square, is shown being sharpened in Fig. 3 with a flood of soluble oil coolant directed on the tool.

Sharp, smooth, and strong cutting edges can be produced by using a wheel of the proper grain size and related characteristics, and by selecting the proper equipment for grinding each type of tool. Equipment should be provided with means for accurately controlling the tool angles and forms to be ground. At Ford, qualified personnel are selected and instructed regarding recommended grinding practices. When authorized changes to the original tool angles and forms are made, the blueprints are marked accordingly, and a copy forwarded to Manufacturing Engineering for revision of the original drawing.

Fig. 6. Plastic coating is applied to cutting tool edges, particularly sintered-carbide tools, to protect them from chipping, breaking, or other damage.

Inspection of Reground Tools

Since reground tools are to be used like new tools, it is necessary to insure that the original cutting characteristics are maintained. The kind and percentage of tools to be inspected are based on the value of the tool, the quantity normally used, set-up time, consequences of tool failure, and the accuracy and surface finish requirements of the work-piece.

To insure that the ground tool has the proper cutting characteristics, the inspection should determine that original angles and forms are maintained according to the latest blueprint, and that cutting surfaces are of adequate finish and free of burns or cracks. The grinding room is notified if the inspection reveals improperly ground tools, if grinding equipment is not in proper working condition, or if proper grinding practices are not being followed.

Tool Trouble

To minimize waste, every effort is made to detect trouble as early as practicable. Troubles and their apparent causes are reported to the affected Activities, such as Production, Manufacturing Engineering, Metallurgical, Maintenance,





Fig. 7. Durable containers made to fit the tools closely, and deep enough to prevent the tools from falling out, are used for storage.

Quality Control, Stores, and Purchasing. Upon determination of the cause, necessary measures for correction are taken. Records of tool troubles and the corrections made are maintained. Such records aid in the correction of similar trouble, and the evaluation of the efficiency of tooling and equipment. Also, they provide reference data for future planning.

Tool Tests and Analysis

Improvements in tools and their applications are often achieved by performing field tests. The recommended methods for conducting such tests and of reporting and evaluating the results, have been outlined in appropriate instruction sheets. Performance testing of tools has been found to be a practical method of determining the most economical tools to be specified and used. Such tests help in evaluating proposed tooling improvements such as new or changed designs, construction, or other features; and in determining the optimum feeds and speeds to obtain maximum life and specified work-piece surface finish.

Performance testing of production and service tools, including both new tools and those in use, is normally conducted under the surveillance of the Manufacturing Engineering Activity of the division or plant specifying or using the tool. When the test involves company-wide application, the appropriate Manufacturing Staff Activity is notified. To prepare for the test, fea-

tures of the tool or operation to be tested are determined. Some of the features tested are speed, feed, and depth of cut; type of tool; material or heat-treatment of the tool; tool-holder or accessory; type of grind; sequence or combination of operations; and tool source. Whenever possible, only one feature is tested at a time. If more than one feature must be tested concurrently because of unusual operating conditions, all of the tools tested are subjected to the same variations.

In preparing for tests, it is ascertained that machines to be used are in good condition, free of chatter or other poor machining conditions. When necessary, an automatically operated counter is installed on the machine. An adequate number of tools required for test are procured through the appropriate Purchasing Activity. At least three tools are obtained from each vendor, and where practicable, the identity of such tools is obliterated and the tools marked in code for identification. A Tool Performance Record, Fig. 4, is kept with the tools or at the machine to record the data for each test tool.

Method of Testing Tools

The Tool Testing Activity or tool grinding personnel uses the Tool Performance Record to record the data required for the evaluation of performance. During the test, all tools, materials, speeds and feeds, and other machining conditions must remain constant. Variables

which cannot be avoided, or other testing methods which are necessary are noted. At least six runs are made with each tool. However, to determine the actual number of regrinds, the tool is used to completion whenever possible. The amount ground off after each regrind is recorded, and the tools examined by the Tool Analyst before and after each regrind.

Either of the following two test methods are used for the evaluation of performance. In one method, the maximum number of pieces a tool will produce for a wear-land of 1/32 inch under normal operating conditions is determined. Then all test tools are operated to produce the same

number of pieces. Records of the variations in wear-land dimensions, and the amount ground off each tool are maintained. For testing certain tools or materials, some other wear-land dimensions may be selected, but 1/32 inch is generally used. A Brinell glass or comparator is used when necessary to insure accurate measurements.

In the second test method, a single tool is used under normal operating conditions as long as it continues to produce quality parts. Then, all test tools are used on regular production runs to produce a number of pieces equal to 80 per cent of the amount obtained with the first tool. The size of wear-land, amount ground off the tool,

Reference Chart for Selecting Coolants and Cutting Oils

The following chart lists recommended coolants and cutting oils for various machining operations and materials when using high-speed tool steels. Approved equivalent coolants may be substituted although the listed ones are preferred. For carbide tools, M-589-B standard soluble oil, petroleum base, is recommended in those instances where a coolant is desired. Use in a concentration that will keep corrosion at a minimum. Recommended dilutions are between 24:1 and 60:1.

The chart is to be read as follows: M-589-B, 24:1 means that M-589-B is mixed with water in the ratio of 24 parts of water to 1 part of oil; M-501 and M-4635-A, 5:1 means that 5 parts of M-501 are mixed with 1 part of M-4635-A. In those instances where two different fluids are given for the same operation on the same material, the top fluid is recommended and the second or bottom fluid is optional.

FERROUS METALS											
Type of Material	Automatic Screw Machines	Boring, Milling, Profiling, Chucking	Broaching	Drilling	Gear Cutting	Gear Shaving	Hand Screw Machines & Lathes	Threading and Tapping	Honing	Grinding	Thread Grinding
Carbon Steels	M-3C5	M-589-B 24:1	M-501 and M-4635-A 5:1 or Sol. Oil*	M-589-B 24:1	M-3C5 or M-589-B** 24:1	M-3C3	M-589-B 24:1	M-3C5	M-4640-B	M-589-B 60:1 or M-3C6	M-4635-H
Alloy Steels	M-3C5	M-589-B 24:1	M-501 and M-4635-A 5:1 or Sol. Oil*	M-589-B 24:1	M-3C5 or M-589-B** 24:1	M-3C3	M-589-B 24:1	M-3C5	M-4640-B	M-589-B 60:1	M-4635-H
Stainless Steels	M-501 and M-4635-A 5:1	M-501 and M-4635-A 5:1 or Sol. Oil*	M-501 and M-4635-A 5:1	M-501 and M-4635-A 5:1 or Sol. Oil*	M-4635-H	M-3C3	M-3C5 or Sol. Oil*	M-3C3 or M-4635-H	M-4640-B	M-3C2 60:1	M-4635-H
Steel Castings	M-501	M-589-B 24:1	M-501 and M-4635-A 5:1 or Sol. Oil*	M-589-B 24:1	M-3C5 or M-589-B** 24:1	M-3C3	M-589-B 24:1	M-501 and M-4635-A 5:1	M-4640-B	M-589-B 60:1	M-4635-H
Cast or Malleable Iron	M-501	M-589-B 24:1	M-589-B 24:1	M-589-B 24:1	M-3C4 40:1	M-4635-H	M-3C4 40:1	M-3C4 40:1	M-532-A-B or M-4640-B	M-3C4 40:1	M-4635-H
NON-FERROUS METALS											
Aluminum	M-501 and M-4647-B 19:1	M-3C2 40:1	M-3C2 40:1	M-3C2 40:1	M-3C2 40:1	M-3C2 40:1	M-3C2 40:1	M-3C2 40:1	M-4640-B	M-3C2 40:1	M-3C2 40:1
Copper and Copper Alloys	M-501	M-589-B 40:1	M-589-B 24:1	M-589-B 40:1	M-501 or M-589-B** 24:1	M-589-B 24:1	M-589-B 40:1	M-501	M-532-A-B	M-589-B 60:1	M-501 and M-532
Magnesium	M-501	M-501 or Dry	M-3C5	M-501 or Dry	M-501	M-501 or CO ₂	M-501	M-501	M-4640-B	M-501	M-501
Zinc	M-501	M-589-B 40:1	M-589-B 24:1	M-589-B 40:1	M-589-B 40:1	M-589-B 40:1	M-589-B 40:1	M-589-B 40:1	M-4640-B	M-589-B 60:1	M-589-B 60:1
* Consult divisional metallurgist. ** Only where construction of machine permits its use.											

and the number of pieces per grind are recorded on the Tool Performance Record card.

The following methods are never used for the evaluation of performance because they are not accurate and will result in erroneous test results:

1. Running a tool until it fails and will no longer cut properly; or
2. Running a tool until it has become worn down so that the work-piece is no longer within acceptable tolerances.

Upon completion of the performance tests, the Tool Performance Record card is signed by the Department Foreman, and used by the Tool Analyst to prepare a Tool Cost Analysis, Fig. 5. This form is used to furnish his recommendations to Purchasing and to initiate other actions to improve tooling operations. He obtains concurring signatures and distributes copies to the concerned Divisional and Manufacturing Staff Activities.

Handling and Storage of Tools

Perishable cutting tools should be protected against damage during handling and storage. Improper handling or storage methods may result in defective tools. To prevent this type of injury, the cutting edges are protected when tools are stacked in quantities. This may be done by protecting the tool with a suitable coating—the most common coating being the plastic type, Fig. 6. While such coatings are generally applied to sintered-carbide tools, they may also be economically applied to other tools. Hitting or dropping of the tools on hardened surfaces should be avoided while they are being mounted or dismounted. Instructions regarding proper handling and storage methods are provided to all personnel affected.

When not in use, tools are stored in suitable containers such as the ones seen in Fig. 7. Containers should be sufficiently durable and fabricated of such materials so that tool cutting edges will not be damaged. Various types of containers such as boxes, blocks, racks, and trays may be used. Whatever type is used, the container should be made to fit the tool closely and should be of sufficient depth to prevent the tool from falling out of the container. Other tools,

which are not in containers, should be stored on wood or other suitable surfaces, and in a protected area.

Use of Coolants

Fluids are used in many metal-cutting operations to cool and lubricate both the tool and the work. Other reasons for their use are: to provide finer surface finish on the work-piece, to reduce power consumption, or to flush away chips. Coolant is seldom used when machining cast iron because of the abrasive nature of the combined coolant and cast-iron dust.

At Ford, the type of coolant required for a particular application is selected according to a Manufacturing Standards "Reference Chart for Selecting Coolants and Cutting Oils," shown in the accompanying table. An adequate flow of cutting fluid is essential. Cutting fluid systems are provided with means for removing foreign material. Foreign material and refuse are causes of undue wear on the coolant pumps, or of contamination, or rancidity in the coolant.

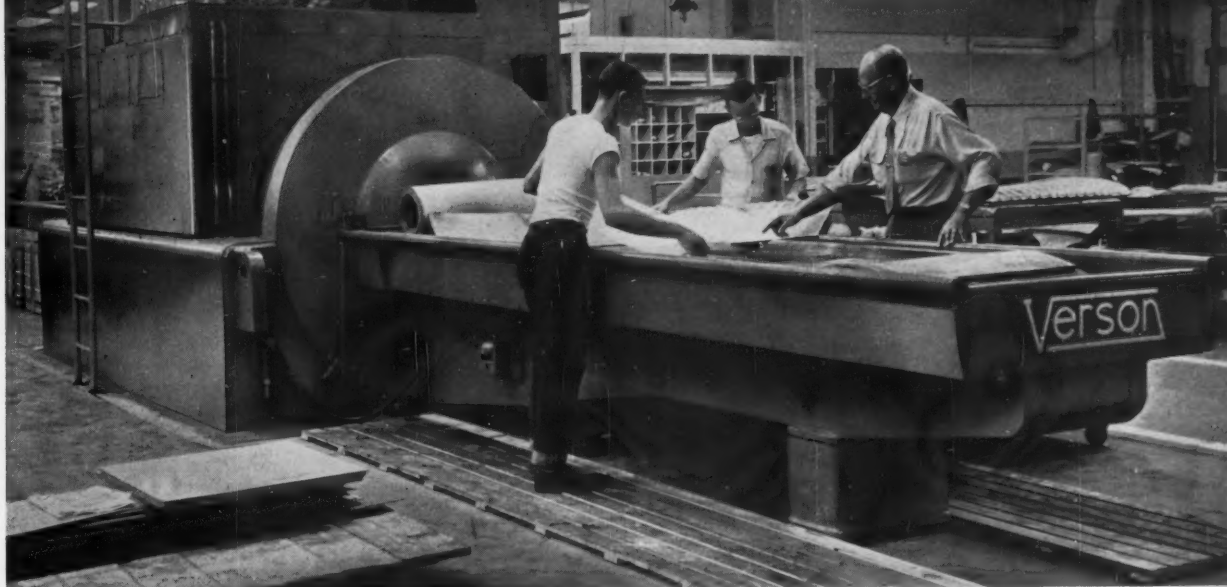
Salvage Methods

Worn or obsolete tools can often be salvaged for use in applications similar to the original. To achieve this objective, the Activity responsible for salvage operations reviews tool usage regularly. Adequate records of usage and application are established indicating the reassignment of tools after they are no longer usable for their original application. The application and any necessary reworking of salvaged tools is coordinated. In order to prevent unbalance in inventories, salvaged tools are routed through Stores and Tool Stock Cribs and not issued directly to the Production Activity. They are inspected in the same manner as new tools.

Lists of obsolete and excess tools from each division are circulated among the other divisions of the company which might have use for them. The divisions review such lists and determine which tools can be used. Those which are not requested by the Production Activities are referred to the General Salvage Department which will select the ones they believe capable of being salvaged. The General Salvage Department periodically compiles a list of available tools and circulates it among the divisions of the company.

HIGH-PRESSURE FORMING

on
Verson-Wheelon
Presses



Recent developments in the forming of steel sheets with an inflated rubber bag have introduced potentialities which were previously overlooked

By O. E. WHEELON

SONIC and supersonic flight have caused a major revolution in the manufacturing techniques of the aircraft industry. This is particularly noticeable in the bulk of the small components that fall naturally into the category of parts produced on hydraulic presses by the Guerin process, in which rubber pads are used as a substitute for a mating die member. This process has long been employed in plants of the aircraft industry.

Efforts exerted to provide the high unit pressures required to form parts from the heavier gages of metal, that is, metal from 0.072 to 0.250 inch thick, resulted in the development of the Verson-Wheelon press that was introduced to industry in 1952. Briefly, this press forms parts

that have been placed within its cylindrical body by inflating a rubber bag or cell with hydraulic fluid. The pressurized fluid expands the rubber cell and the latter, in turn, forces the work blanks over and around dies or form blocks that have been placed on the press table. High uniform pressures are delivered which facilitate the side forming of work-pieces to such an extent that the hand-forming operations previously necessary to remove wrinkles have been largely eliminated. Another important advantage of this type of equipment is that metal sheets from 1/8 to 1/4 inch in thickness can be formed with ease to required shapes.

In the rapid adoption of the Verson-Wheelon press by the aircraft industry, some of the more

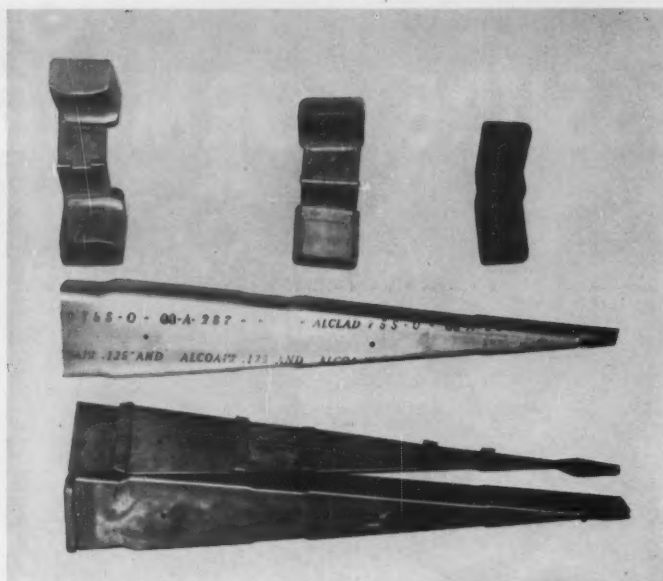
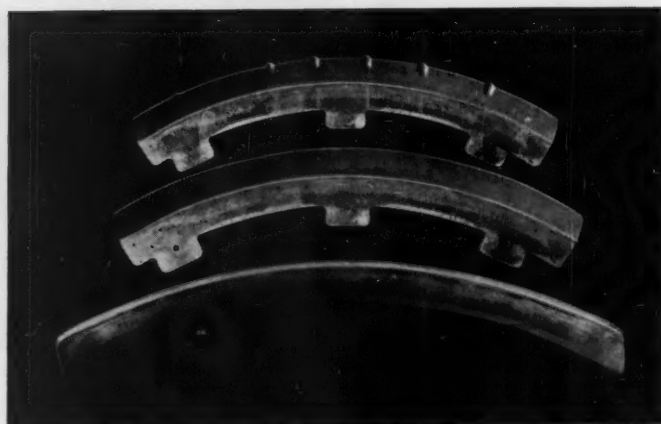


Fig. 1. (Left) Form blocks and restrike shoes employed for producing the aluminum-alloy aircraft part seen in the middle of the illustration from 0.125-inch thick stock

Fig. 2. (Right) Simple type of side pressure-plate (at the bottom) which finishes a part to the shape seen at the top



subtle advantages of high uniform pressure on light-gage metal were overlooked. Three new manufacturing techniques were made possible that will be here considered. These are based, respectively, on the use of side pressure-plates, female dies, and dam- or draw-rings. It should be kept in mind that one of the most significant factors in the use of this type of equipment is the uniformity of the pressure that is applied on the top and all sides of a part. In practical terms, this means good flange detail on the work-pieces and a facility for making complete return or C-flanges on work by the use of under-cut form blocks. There is less tendency to break form blocks by differential pressures. There is no fall-off in pressure on the sides of parts or in low areas.

The high side pressure obtainable has made possible the use of simple side pressure-plates for restriking operations to remove moderate wrinkles from parts of normal gage and set

joggles that must be formed within close tolerances on heavy-gage parts. At the bottom in Fig. 1 are shown the form blocks which are used in forming the aluminum-alloy part seen in the center of the illustration. At the top are restrike shoes that bring the side joggles on the part accurately to size.

At the top in Fig. 2 is seen a part that was formed to the contour shown through the use of the side pressure-plate at the bottom of the illustration. In the center is seen a piece produced without the use of the side pressure-plate.

The technique of employing side pressure-plates of this type has the following advantages over conventional wedge blocks mounted on large baseplates: (1) The tooling is less expensive. (2) The forming block does not occupy as much press table area and the table will, therefore, accommodate more work. (3) The pressure-plate does not slide with respect to the work-piece with the result that there is no marring or scratching

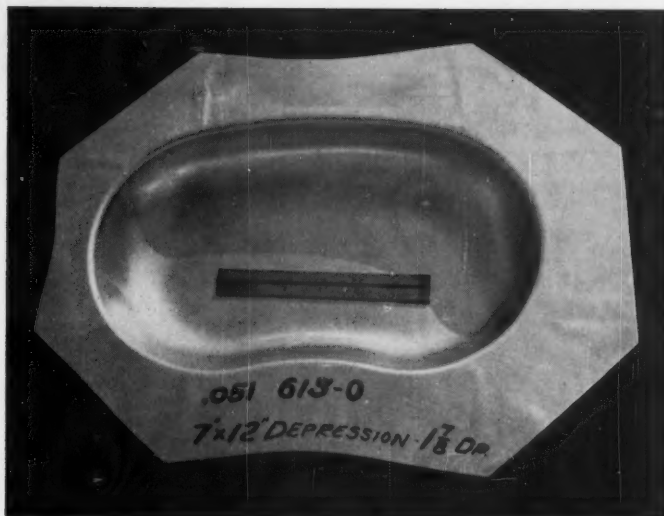
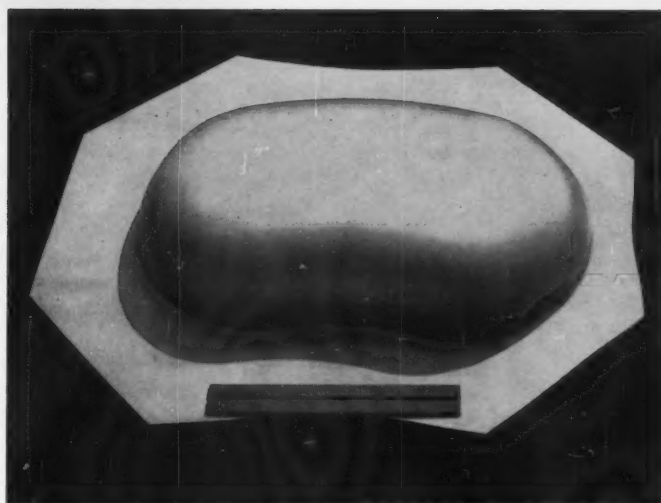


Fig. 3. (Left) Typical part drawn from sheet aluminum in a Verson-Wheelon press, the cavity produced measuring 7 by 12 inches and having a depth of 1 7/8 inches

Fig. 4. (Right) Opposite view of the part in Fig. 3 which illustrates the ability of the equipment used to produce work-pieces virtually without any wrinkles



of the work. (4) The wear on auxiliary tooling is less than with the types of wedge blocks that are conventionally used.

Side pressure-plates can be made of Kirksite, Cerro-True, fiber glass, or 1/4-inch cold-rolled steel plate formed to the required contour. If joggles or a changing curvature require accurate location of the side pressure-block, correct positioning may be obtained by providing dowels or other locating elements on a faceplate and on the pressure-block. However, a faceplate is seldom justified unless there are sharp joggles and the work is of heavy-gage material.

A considerable variety of parts have been made on a production basis at the Douglas plant in Santa Monica by using a female die and forcing the sheet into the die by the rubber cell. With a proper lubricant, box-shaped parts and tapered channels have been drawn to depths as great as 2 inches. Top and bottom views of a pan produced in this manner are presented in Figs. 3

and 4. This pan was formed from 0.051-inch thick 61S-O aluminum. The depression measures roughly 7 by 12 inches and is 1 7/8 inches in depth.

Shallow wing-tip skins have been drawn in a Verson-Wheelon press by employing a conventional drop-hammer die. This practice has the advantage of inexpensive tooling, as well as low set-up and unit costs. Some remarkable drawing work on body steel has been performed by the Twin Coach Co., Buffalo, N. Y., by using a face pressure-plate in combination with a die to eliminate all tendency of the material to wrinkle as it is drawn. The door panel seen in Fig. 5, which was made with a pressure-plate constructed of high-density wood, is a good example of this type of work.

The Wyatt Mfg. Co., Mishawaka, Ind., has applied the technique of using female dies on aluminum alloys and stainless steel for aircraft components, and also on brass for band instru-

ment parts. A good example of what has been accomplished by this company through using a female die is shown in Fig. 6. A starter die with generous drawing radii was used first and then a re-hit female die for reducing the radii. This part was previously fabricated from several drawn pieces by welding them together into an assembly. The part, of stainless steel, is obviously now a single piece.

In using female dies it is important that the die materials have a low coefficient of friction with respect to the material employed. Blank-holding can be accomplished either by using the rubber cell alone or in some instances by employing a pressure-plate. The lubricant is important and it must be remembered that the rubber pad acts as a punch. There is a tendency, therefore, for parts of certain designs to draw more from one side than from the other.

Materials that have been successfully used for female dies are (1) laminated phenolic-impregnated high-density wood, (2) phenolic materials

such as Richlite, (3) steel, (4) Kirksite, and (5) aluminum. In general, an aluminum die has too high a coefficient of friction when used with aluminum sheets. Such dies can be sheathed with a metal such as low-carbon steel having a lower coefficient of friction. If an economic advantage can be obtained in adopting this practice, the steel sheet can be placed over the aluminum die and formed to shape. The steel sheet can then be trimmed and attached to the die face to supply the sheathing.

When female dies are designed for performing a drawing operation over a large area, the dies should be made with a small air vent. Otherwise there will be a tendency for air to be trapped under the work-piece, become compressed, and form a back blister on the work as the pressure is released. A method that has proved successful in the application of unvented dies is to apply partial pressure to force the metal sheet part way down into the die, then, to remove the part for the reapplication of lubricant and to permit trapped air to escape, and finally replace the part in the die and apply high pressure to bring the part to the required size.

Operations involving the use of female dies on Verson-Wheelon presses are not comparable with the potentialities in deep-drawn operations performed on double-action drawing presses or on Hydroform and Marform presses. There are, however, a great many comparatively shallow drawn parts required by industry that can be easily produced on simple rubber-pad presses. This is particularly true because of the uniform pressures obtainable on the bladder type rubber press and the fact that the blank-holding pressure and the drawing pressure are identical on this type of equipment.

In conventional hydraulic press operations performed with a male die, the unsupported raw edge of the work is often formed with radial wrinkles and in the case of light-gage materials, flanges may even fold back on themselves so as to make hand work difficult or impossible. This has long been recognized as a major handicap to rubber forming. Most plants have auxiliary equipment and employ a considerable number of employees to finish such parts by hand-working operations.

When female dies are used in combination with rubber pads, it is possible to keep wrinkles from starting because the rubber acts as a blank-holder and keeps the work in contact with the die surface whether it is flat or of a contoured

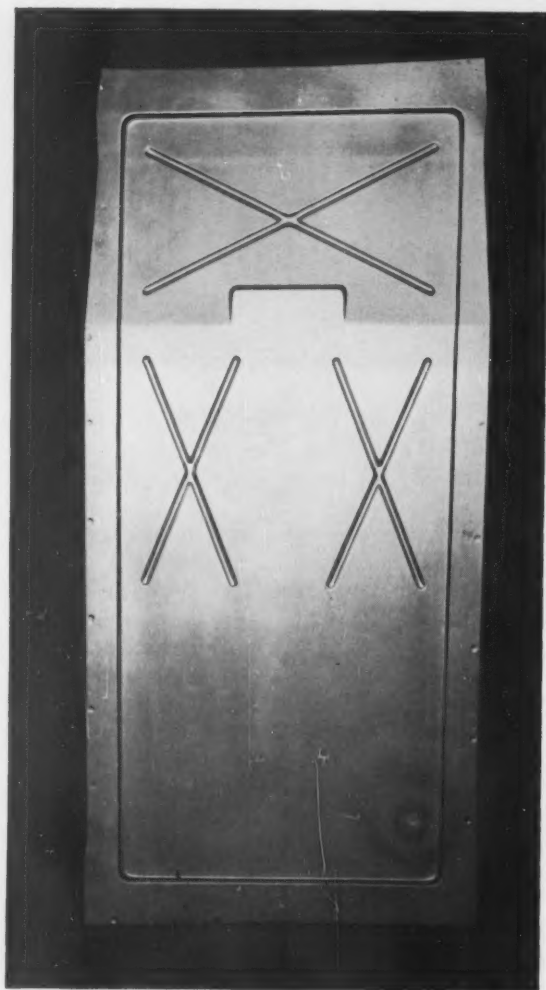


Fig. 5. Door panel produced under rubber pressure on a female die and using a pressure-plate made of high-density wood

Fig. 6. Stainless-steel part of complicated design, which was formerly fabricated from several drawn pieces and welded together, is now made in a female die

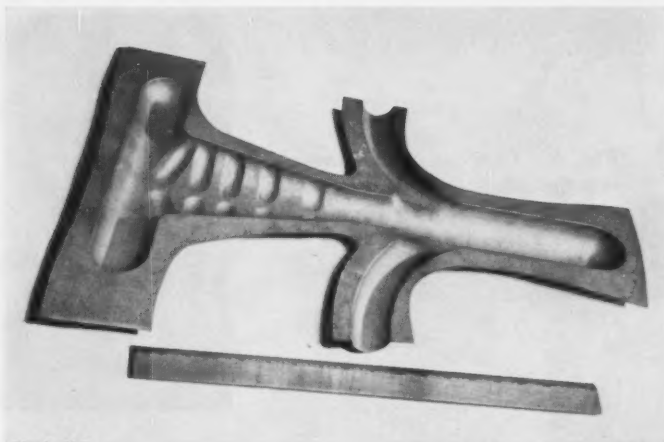


Fig. 7. Aluminum-alloy part produced in two operations with the same tooling, plugs being removed from the male die for the second strike



shape. If wrinkles can be prevented from starting, materials of light and moderate gage can be made to shrink a considerable amount. Open or closed bevels do not offer a problem when female dies are employed.

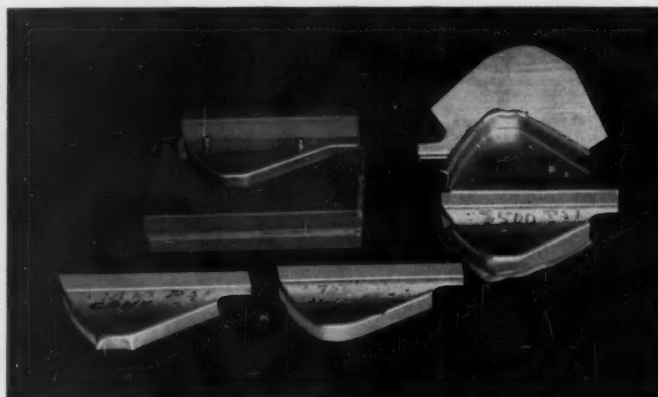
Tooling of this category, developed for an experimental part, is shown in Fig. 7 with several parts produced with this die equipment. The blank in this case has 1 1/4 inches added to the developed blank. The large horseshoe-like drawing is actually an auxiliary female die. It was made of aluminum alloy. At first, it was difficult to obtain a perfect part with this tooling, and a great deal of time was spent in developing the contour of the draw-ring around the nose which was the region of shrinkage. When attempts were made to produce the part with the lightening holes preblanked, the work flowed over the bend radius and drew material from the lightening hole flanges.

To eliminate this difficulty, the cavities in the form-block for the lightening holes in the work

were plugged for a first operation in which the outer flange was simply drawn. After this first draw, the lightening holes were pierced. The part was then solution heat-treated and re-hit in the "as quenched" condition using the same tooling with the plugs removed from the die cavities to obtain a final accurate part. Stretching of the lightening hole flanges eliminated all need for hand work to remove any distortion resulting from heat-treatment. This type of part requires a trimming operation after forming which may be objectionable in some cases. The over-all length of this example is about 14 inches.

Tooling designed for producing a difficult part from 0.072-inch thick aluminum sheet with an extremely sharp radius at the bottom of a 3/4-inch flange is illustrated in Fig. 8, together with several work-pieces made by the use of this tooling. Attempts to make this part without a blank-holding action resulted in folding wrinkles so tight that it was impossible to eliminate them by hand work. When using a conventional block at

Fig. 8. An illustration showing the advantages obtainable through the use of a draw-ring for a small flanged part



low pressure, the part required approximately thirty-five minutes of hand work to eliminate the wrinkles. Now the part is formed as shown in the bottom center of the illustration at a pressure of 7500 pounds per square inch in a single operation with a completely satisfactory flange. Parts produced by the previous methods and having wrinkles are seen at the right and left of the accurately produced part. Excess stock has, of course, been trimmed from the latter. For work of this character, it has been found desirable to tailor an individual throw pad a little larger than the blank development and to use rubber of the softest grade obtainable, say, from Shore 30 to 40.

The same technique has been employed by using a dam- or draw-ring with a net blank when a lap of $1/8$ inch can be provided for the blank-holding action of the rubber. By "net blank" is meant a blank that does not allow for any excess metal to be later trimmed off. In some instances, parts of this type can be formed to a high degree of accuracy. In other cases, however, there is a tendency for a sharp curl to develop. In regions where extreme shrinkage occurs, there are wrinkles. There is a distinct difference in the type of wrinkle. Every wrinkle will be of a gradual convex type, easy to remove by hand work or by ironing out through the use of a simple re-strike side pressure-plate.

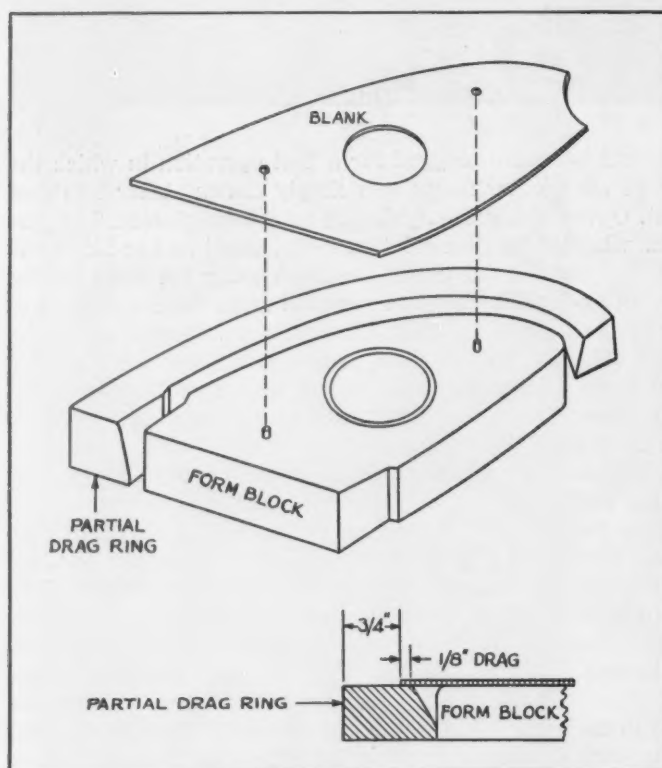
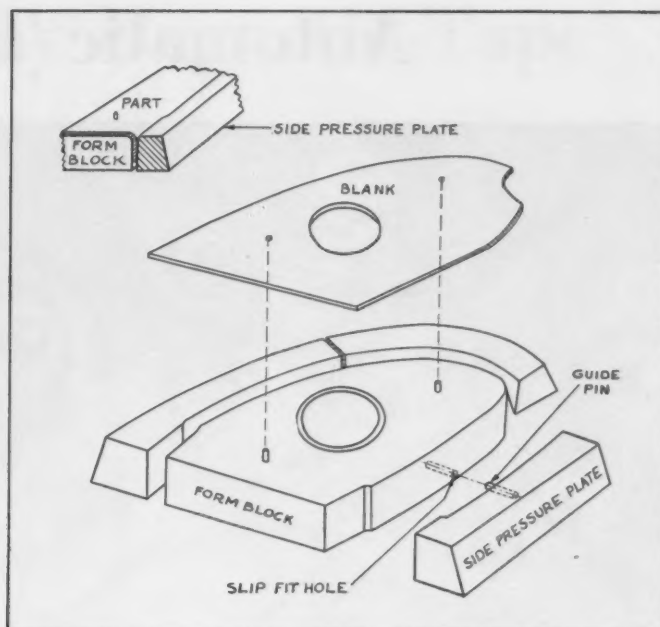


Fig. 9. Diagram of tooling employed in an operation which involves the use of a form-block and a partial drag-ring

Fig. 10. Drawing which illustrates manner of accurately locating side pressure-plates relative to a form-block

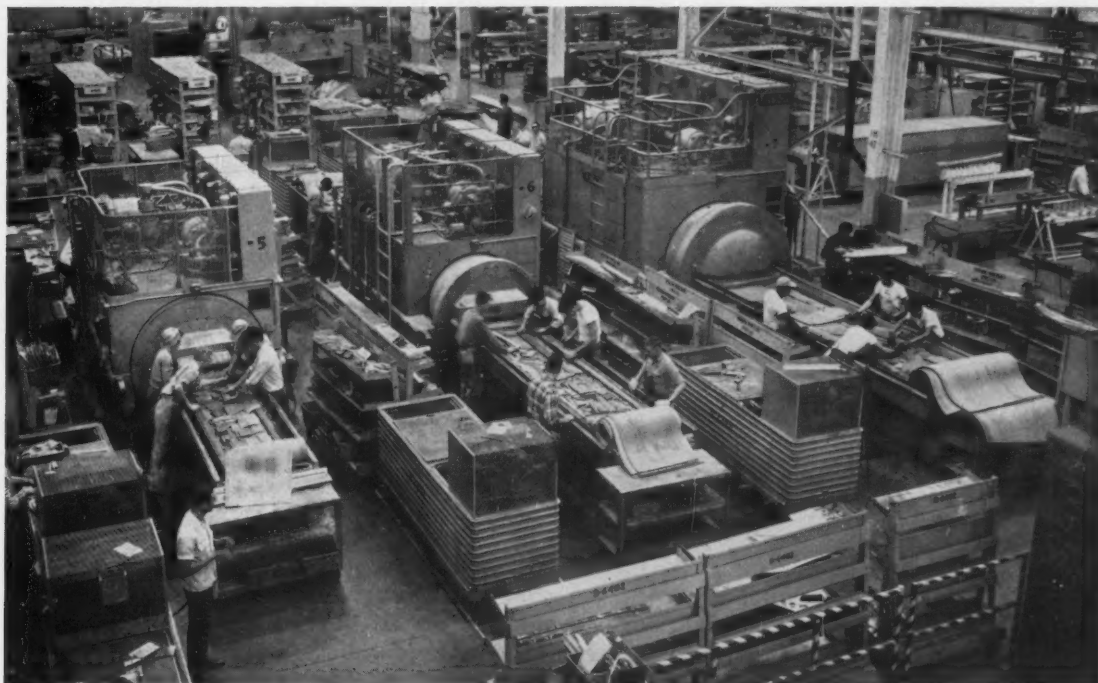


The diagram in Fig. 9 illustrates the form-block and partial drag-ring employed to produce a part with a net flange, that is, a flange of the desired depth and which does not require trimming. The diagram in Fig. 10 shows tooling for this type of work provided with side pressure-plates that are located in respect to the form-

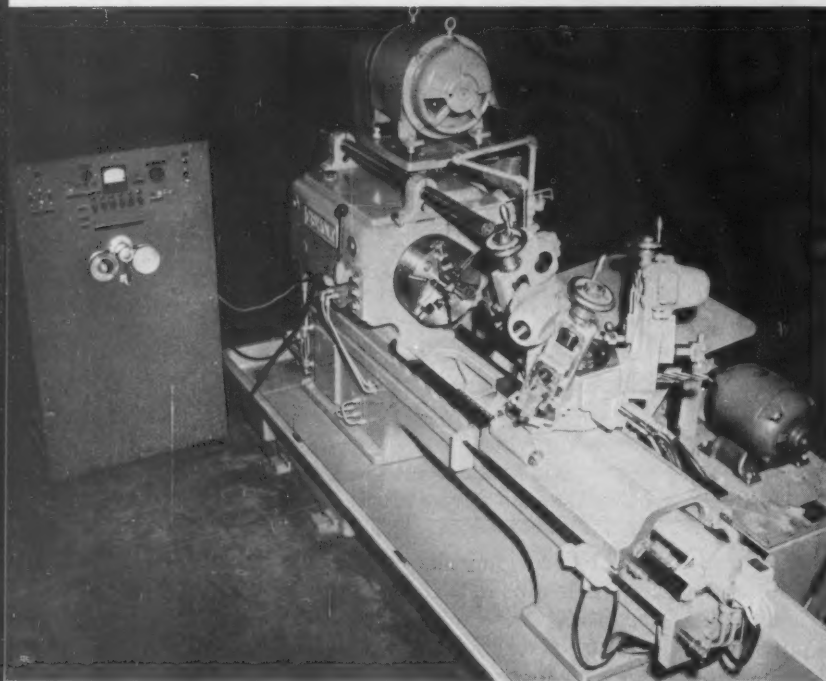
block by providing slip-fit holes in the form-block and guide pins in each side pressure-plate. There are cases where a net blank formed with side pressure-plates would have an economic advantage over a part made with excess material that required trimming after forming. Both trimming and excess metal are eliminated.

Fig. 11. General view of three Verson-Wheelon presses in a plant of the Douglas Aircraft Co.

Courtesy, Northrop Aircraft, Inc.



Automatic Turret Lathe



Abstract of a paper that was presented at the Nineteenth Annual Machine Tool Electrification Forum, sponsored by the Westinghouse Electric Corporation, Buffalo, N. Y.

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AUTOMATIC operation of machine tools from information stored on control tape is a promising newcomer to the metal-working industry. Most of the major problems in tape control of machine tools have centered around practicability. The system must fill the basic requirements common to any machine tool control system, and be as simple and compact as possible. Maintenance must be reasonably low-cost and easy, and the system so designed that it can be operated by unskilled personnel. Also, the control must be economically practical, both in initial and operating cost for virtually all types of work.

Superimposed on these requirements are the specific operating objectives of the particular system. The Gisholt Machine Co., in following an extensive development program on the operation of machine tools from stored information, has produced a tape control for a turret lathe which comes close to fulfilling all the requirements. The tape control system is essentially an analogue computer used in a closed-loop system to provide a completely automatic machine cycle. Basic elements of the system are a multi-track magnetic tape; detector screws for each track; an amplifier and shaper for all but one of the detectors, and a control panel for that one; a reference meter bar and its associated detector screw; and

finally, a phase-sensitive detector and a hydraulic servo valve.

The stainless-steel magnetic tape can store information on several tracks, but for the sake of discussion, it will be considered to have only three—an auxiliary track, a primary signal track, and a reference track. The auxiliary control track consists of a series of parallel lines for all step functions, such as spindle-speed change or indexing. Parallel magnetic lines are recorded on this track and when it is desired to have this track give a signal the lines are shifted laterally. The screw pick-up reads this lateral shift as a phase shift, and each 90-degree phase shift will present to a counting circuit the information calling for the performance of an auxiliary step function.

The lines on the primary signal track may be parallel to the edge of the tape or may slant to the right or left. This track determines the speed and direction of the machine carriage. If the tape speed is held constant, the rate of carriage movement is a function of the displacement angle of these primary signal traces. The reference track, which supplies the reference signal, consists of a series of parallel lines recorded on the tape at the same time the primary signal information is recorded.

To more clearly illustrate these tracks, a sec-

Controlled by Magnetic Tape

tion of control tape was dipped in a bath of lacquer thinner containing finely divided particles of iron in suspension, producing the sample seen in Fig. 1. The upper track is the auxiliary control track, and does not include a phase-shift signal. The center, or primary signal track, clearly indicates the manner in which the traces slope to provide a variable frequency for carriage movement control. This makes it possible to exercise complete control over acceleration and deceleration during any part of the carriage movement. The lower track, or reference track, is merely a series of parallel lines. The number of lines on any track is not critical, the primary consideration being to provide sufficient lines to generate a signal amplitude which is large enough to result in an adequate signal-to-noise ratio. With the tape shown, the signal-to-noise ratio is approximately 230 to 1, and the pick-up output voltage is approximately 0.100 volt r.m.s.

The tracks on the tape are continuously scanned by three screws, all mounted on the shaft of a 60-cycle synchronous motor that rotates at 3600 R.P.M. Each screw has double threads with a pitch equal to the distance between traces or lines on its respective track. As the screws revolve, the pick-ups associated with the screws present control signals to the system. These signals are sinusoidal voltages of 120 cycles per second.

The signal which is picked up from the reference track is fed into a power amplifier which drives a synchronous motor connected by means of a flexible shaft to another screw. This screw picks up signals which have been recorded on a steel meter ribbon. The magnetic impressions causing these signals consist of pips which have been accurately located on the ribbon and spaced to correspond to the threads of the screw which

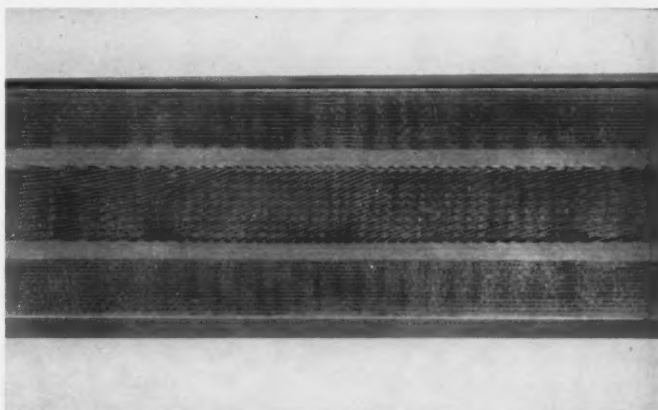
has a double lead. When the carriage is stationary, the pick-up associated with this screw also generates a signal of 120 cycles per second. This unit, called the secondary generator, performs two functions: provides a feed-back signal for the servo loop, and automatic compensation for any tape shift during playback.

As mentioned, the traces of the primary signal track can be either parallel or can skew to right or left. If the tape is stationary, the primary signal pick-up will always generate a voltage of 120 cycles per second, regardless of the slope of the lines on this track. If the tape is moving at a constant rate, however, the frequency of the voltage will change in proportion to the slope of the lines. Depending upon the direction in which the screw is rotating, the frequency will be more or less than the base frequency as the lines skew to the right or left. Since the system uses continuous scanning, this change in frequency is seen by the system as a phase shift.

A signal from the primary track is fed into a phase-sensitive detector, and the signal from the secondary generator is also fed into the same detector. This detector senses the instantaneous error signal and actuates the servo valve to correct for it. The signals which are being picked up are all shaped and squared before they are fed into the phase-sensitive detector. This results in circuitry which is not amplitude conscious.

An experimental set-up of the over-all control applied to a Gisholt Fastermatic automatic turret lathe is shown in the heading illustration. The controls, seen at the left, were panel-mounted to provide convenience in adjustment, test, and analysis. Parts of the control system which are attached to the lathe consist of a servo valve (shown at the lower right on the end of the longitudinal cylinder), and a secondary gen-

Fig. 1. Section of a stainless-steel magnetic tape that has been specially treated to show the auxiliary control track (top), the primary signal track (center), and the reference track (bottom)



erator operating in conjunction with a meter ribbon. The meter ribbon is attached to the lathe bed, while the secondary generator is attached to and moves with the carriage which is the controlled element.

A close-up view of the experimental control panel is shown in Fig. 2. The controls on the extreme right and left are for the power supplies. Near the top center is a meter which indicates the feed rate of the turret in inches per minute. The knob to the left of the meter is used to adjust the phase angle to bring the system to zero. To the right of the meter is a manual tape-drive control to provide either manual forward or reverse of the tape-drive motor. Immediately below the feed-rate meter is a row of lights to indicate which turret face is forward at any part of the cycle. Below the indicator lights is a row of switch knobs which pre-select the desired spindle speed for each turret face.

Since the frequency of the signal produced by the primary signal generator is also a function of the speed of the tape drive, it is possible to have some control over the feed rates for the individual turret faces. Below the row of spindle-speed selector switches is a row of holes providing access to a group of potentiometers. These potentiometers provide means for controlling the tape-drive speed, within limits, for each turret face. It is therefore unnecessary to make a new tape if the recorded feed rates require minor

changes during the operation of any or all turret faces.

Below the feed-control potentiometers is another row of potentiometers. These permit control, within specific limits, of the actual position of the carriage with respect to the information picked up by the primary signal generator. This provision makes minor tool adjustments for tool wear unnecessary.

The tape-drive mechanism is seen at the bottom center of the panel. This is an accurately controlled, electronic, variable-speed drive to provide tape drive and rewinding. For traverse rates, the speed of the tape drive is increased to provide the desired rates. The feed-control potentiometers are also used in this adjustable-speed drive circuit so that the feed-rate adjustments are actually changes in tape-drive speed.

To conserve tape, the maximum displacement angle of primary signal traces is usually used. Since the maximum angle tangent is 0.5, 30 feet of tape will give a total displacement of 15 feet when the meter ribbon equals the control-tape pitch.

Another important consideration in a system of this kind is the technique used for storing the desired information on tape. In many stored-information schemes, the cost of tape processing has made the difference between a control system which could be used only on high-production parts and one which could be universally applied.

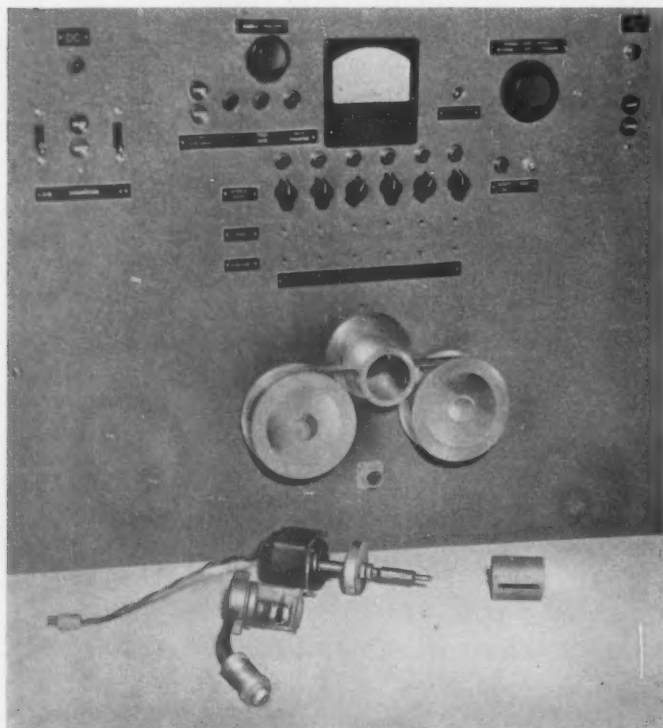
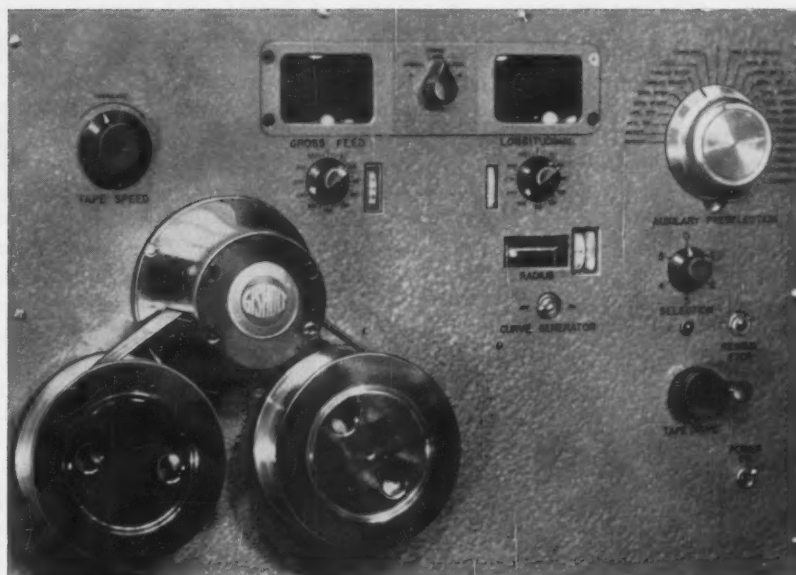


Fig. 2. Experimental control panel employed in conjunction with a servo valve, a secondary generator, and a meter ribbon for automatic operation of turret lathe shown in the heading illustration.

Fig. 3. Mechanism housed in this cabinet simultaneously records two primary signal tracks, as well as auxiliary data for two-dimensional automatic control having considerable flexibility



The recorder for the Gisholt system is housed in a small cabinet, Fig. 3, with its associated electronic equipment in the base. This particular mechanism was designed to simultaneously record two primary signal tracks, together with all provisions for auxiliary control information. The result is two-dimensional control with at least equal or better flexibility than could be obtained with a conventional two-dimension tracer. One of the primary signal tracks would control the movement of the tool in the X-X axis while the other would control the motion of the tool in the Y-Y axis. The resulting tool movement is thus a summation of both movements.

The tape-drive mechanism, seen at the lower left, moves the tape past the recording head during the recording process. A four-position selector switch provides a means of selecting the information being recorded. By means of this switch, the information being fed into the mechanism can be recorded on the X-X axis, zero, the Y-Y axis, or on both the X-X and Y-Y axes. Behind each window at the top of the panel are electronic devices which will measure to within 0.001 inch the amount of carriage movement being recorded.

Two controls are provided to indicate the direction in which the coordinates of the final tool movement are to be fed into this system. These dials have markings to indicate angles from 0 to 180 degrees in either direction. Thus, when making a tape, a chamfer can be recorded by setting this knob to the correct direction and angle. A radius control switches an integrator into the circuit so that curves, radii, and fillets can be automatically recorded.

On the upper right of the panel is a 40-position

auxiliary pre-selector. This pre-selector is used to record the necessary degrees of electrical phase shift on the auxiliary track so that the necessary auxiliary functions are performed at the time desired.

The knob on the upper left of the cabinet is used to provide coarse control of the tape drive during recording. When the desired final dimension is approached (as read on the electronic measuring devices), the final increments of distance are fed into the unit by means of the hand crank seen at the lower right on the panel. The distances recorded are the result of the total number of electrical degrees of phase shift which are cranked into the system. Each 360 degrees of phase shift represents 0.1 inch of carriage travel.

To illustrate the operation of this recording device, consider the machining of the hypothetical work-piece shown in Fig. 4. Only the cross-slide of a standard Gisholt turret lathe is to be used. The particular part shown was selected to point out some interesting features which make this system somewhat different and also quite versatile. The piece has been dimensioned so that all measurements are taken from its end with regard to the longitudinal axis, and from the center line of the piece in the perpendicular or Y-Y axis. Cut No. 1 will be taken with Tool No. 1 to remove some of the excess stock, and Cut No. 2 will also be taken by Tool No. 1 to form the contour at the right of the shoulder. Then, the toolpost will index, and Cut No. 3 will be taken by Tool No. 2, moving from left to right.

The tool path for this particular piece would begin at the point marked "start." It would then move in angularly to the point marked X, and longitudinally to the left as shown. At the end of

this cut, it would traverse out and back to the starting point. For the second cut, the tool would again move in angularly to the point X, and continue on to point Y. The tool would then cut the 45-degree chamfer, the straight portion, the 30-degree chamfer in the opposite direction, the flat surface, and the radius. The tool would then continue to feed out until it had finished machining the shoulder, and then traverse out and to the left to point Z. During this time, the toolpost would index to present Tool No. 2 to the work. The tool would then traverse in and drop into feed, and machine the 30-degree angle, the straight portion back of the shoulder, and the 0.125-inch radius on the flange.

To facilitate handling the information which must be fed into the recorder, it is tabulated in a step-by-step operation. The result is a set of work sheets with all of the necessary information arranged in steps, and tied into the controls of the recorder.

Other analogue equipment could be used as auxiliary equipment for this device, and practically any odd configuration could be recorded by including more steps in the recording technique. Traverse rates up to 350 inches per minute have been obtained with satisfactory stability.

The recording techniques are simple as well as rapid.

Further developments with reference to this system are in process. There seems to be no reason why a number of auxiliary tracks cannot be utilized, nor why several primary signal generators operating in conjunction with several secondary signal generators cannot be used to provide controlled movement in several directions. Since a control signal is generated regardless of whether the tape is moving or stationary, it would also be possible to use this system to correlate a group of discontinuous functions in several directions either on the same or different machines.

* * *

Aircraft Parts "Test Flown" in a Box

Newly designed aircraft parts can be "flown" to an altitude of more than 22 miles in a 5-ton box that never leaves the ground. Engineers of Westinghouse Electric Corporation at Lima, Ohio, use a 64-cubic-foot test chamber to reproduce atmospheric conditions that range from the hot air of the tropics to the dry, sub-zero cold found in the upper stratosphere.

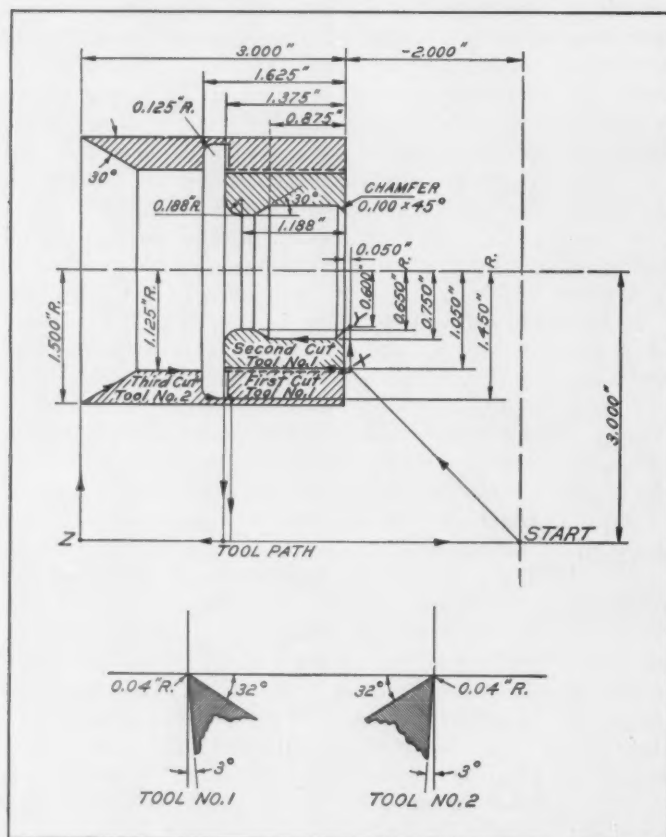
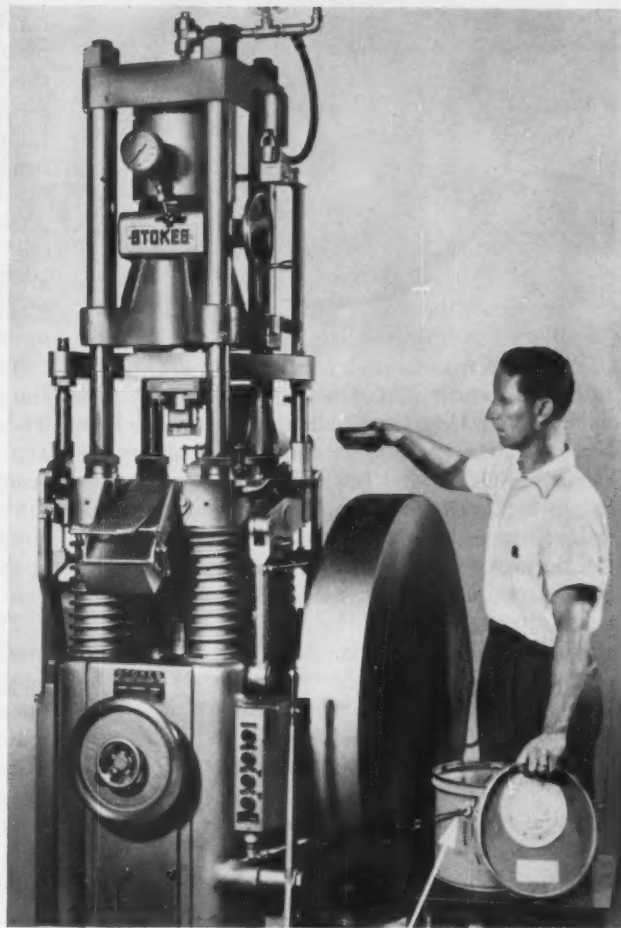


Fig. 4. Test work-piece machined automatically on a turret lathe controlled by magnetic tape. First and second cuts are made by Tool No. 1, and then, after the toolpost has been indexed, the third cut is made by Tool No. 2

Product Designers Turn to Brass-Powder Parts

A condensation of a paper on the evaluation of small brass-powder structural parts in product engineering, presented at the Diamond Jubilee Spring Meeting of the American Society of Mechanical Engineers

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PRACTICALLY all metals can be made into powders, but those most widely used in powder metallurgy today are iron, copper (largely mixed with tin to produce bronze), and brass. Brass is relatively new in the field, and consequently, the pressing and sintering qualities of the powder are not so well known as those of some of the more firmly established metals. But the use of brass powders is increasing rapidly, and it is interesting to investigate why.

A start can be made by considering as a typical brass-powder application the tripper flywheel of a Polaroid Land camera shutter. Accurate control of the shutter is, of course, essential to the proper functioning of a camera, and a great deal of skill and ingenuity are embodied in the design of its shutter mechanism.

The two sides and an edge of the tripper flywheel can be seen under magnification in Fig. 1. In addition to an irregular contour, there is a

depression in one side, and a boss on the other. Also, the part has a precisely located center hole. To produce this part in brass by any process other than powder metallurgy would be difficult and expensive.

Possibly, the part could be a machined extrusion, a precision investment casting, or a die-casting, but in the final analysis, cost would be high. As a brass-powder part, the contour and the center-hole are formed in one pressing operation. Required tolerances, although close, as indicated in Fig. 2, are obtained without coining or machining. Mechanical properties that can be expected in this tripper flywheel are a tensile strength in excess of 25,000 pounds per square inch, and an elongation of better than 10 per cent in a 1-inch test-bar length.

The fact that this part, or any structural part, can be produced successfully from brass powder, reflects the recent accomplishments of

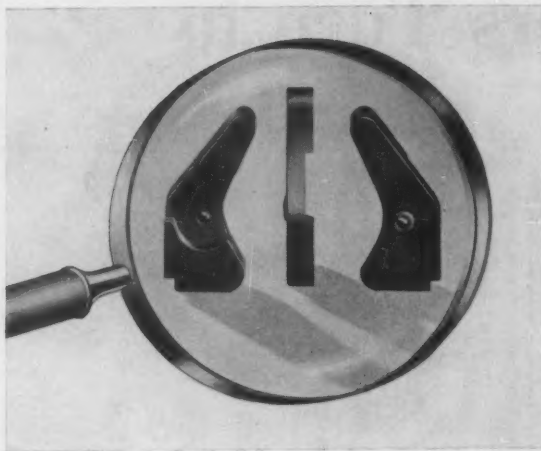


Fig. 1. The contour, depression, boss, and center hole of these tripper flywheels for a camera shutter are formed in a pressing operation.

the metal-powder fabricating industry. It was not long ago that the production of satisfactory brass-powder parts was considered to be extremely difficult, and few fabricators were willing to tackle the problem. Now, production procedures have been developed to a point where the majority of fabricators can turn out excellent parts. As a result, fields of application are expanding rapidly.

During the Korean conflict, over 100,000,000 brass-powder rotors (shown in Fig. 3) for the safety mechanism of artillery ammunition fuses gave excellent service. Recently, a spokesman for one of the arsenals claimed that the rotors saved the Government at least \$10,000,000! Now, many new ordnance parts are specified to be made of brass powder—further evidence that the process is here to stay.

For those unfamiliar with powder metallurgy,

it might be well to describe the compacting of the material as done at the research laboratories of the New Jersey Zinc Co., Palmerton, Pa. In the heading illustration is shown a Stokes 75-ton tablet press which the operator is charging with brass powder premixed with a lubricant. A close-up view of the press table can be seen in Fig. 4. After the feed-shoe fills the die cavity with powder, the punch descends for the compression stroke. Then, a second punch, beneath the table, ejects the green (unsintered) compact, which is swept off the table by the feed-shoe.

The compacts are racked as they come from the press for easy loading in a sintering furnace. There, they are subjected to a temperature of approximately 1600 degrees F. Production speeds from 500 to 1000 compacts per hour are not uncommon on such a press. For suitably designed parts, multiple-punch rotary presses with speeds up to 6000 or more compacts per hour are available.

The majority of brass-powder compacts made measure less than 4 inches in diameter or in length. Four very small parts now being produced are illustrated in Fig. 5 beside a book of matches for size comparison. Still smaller parts are possible provided a minimum wall thickness or diameter of approximately 0.030 inch is maintained.

While it is one of the principal virtues of the powder-metallurgy process that parts so produced can be complex in shape and thus elimi-

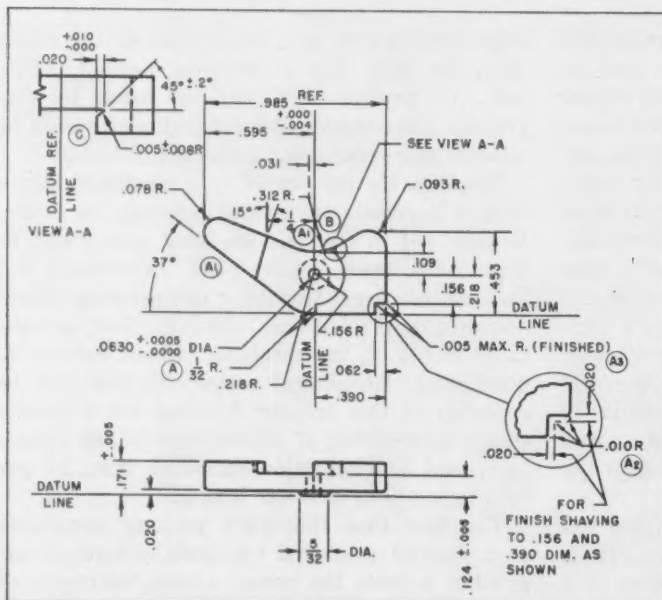


Fig. 2. The close tolerances on the various surfaces of the tripper flywheel appear on this drawing.

Fig. 3. More than 100,000,000 of these brass-powder rotors for ammunition fuses were produced during the Korean conflict.

nate the need for elaborate machining operations, it would be completely unrealistic to claim that any part of intricate design is a "natural." Like many other production processes, powder metallurgy has limitations imposed by both raw materials and existing fabricating equipment.

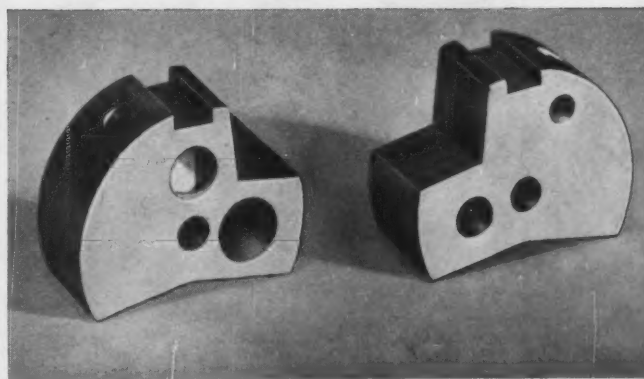
Basic shapes that lend themselves to the process can be cylindrical, rectangular, or irregular, provided they are (1) relatively thick (up to 1 inch), (2) in general, do not involve large variations in cross section, and (3) do not

Table 1. Comparison of Leaded Brass and Four Other Materials

Material	Composition, Per Cent	Sintered Density, Grams per Cubic Centimeter	Tensile Strength, Pounds per Square Inch	Elongation, Per Cent in 1 Inch
80-20 Leaded Brass	Copper.....79 Zinc... 19 1/2 Lead....1 1/2	7.4	20,000	10
Bearing Bronze	Copper 88 1/2 Tin.....10 Graphite 1 1/2	6.4	12,000	1
Structural-Parts Bronze	Copper.....90 Tin.....10	7.0	18,000	2 1/2
Iron-Copper	Iron.....90 Copper.....10	5.9	32,000	1/2
Plain Iron	Iron.....100	5.7	12,000	1 1/2

have a length-to-diameter ratio greater than 2 1/2 to 1. If required, it is easy to press simple flanges, holes, counterbores, slots, keyways, gear teeth, and knurls. On the other hand, parts with narrow or deep splines, feather edges, sharp corners, or under-cuts prove difficult to press. It should be kept in mind, however, that machining operations like drilling, tapping, and under-cutting can be performed easily and economically on brass-powder parts, particularly those of leaded brass.

Comparative data on the properties of pre-alloyed leaded brass and four other materials are given in Table 1. It can be seen that brass compares favorably with the other materials from the standpoint of solid density obtained



with normal forming pressures. The uniform shrinkage of brass during sintering permits accurate die design, and results in a high-density product with minimum forming pressure. Brass has a much more favorable percentage of elongation than the other materials, and in tensile strength is surpassed only by the iron-copper alloy.

It might be said that when compacted and sintered under well-controlled conditions brass-powder parts are comparable in physical and mechanical properties to brass castings. Com-

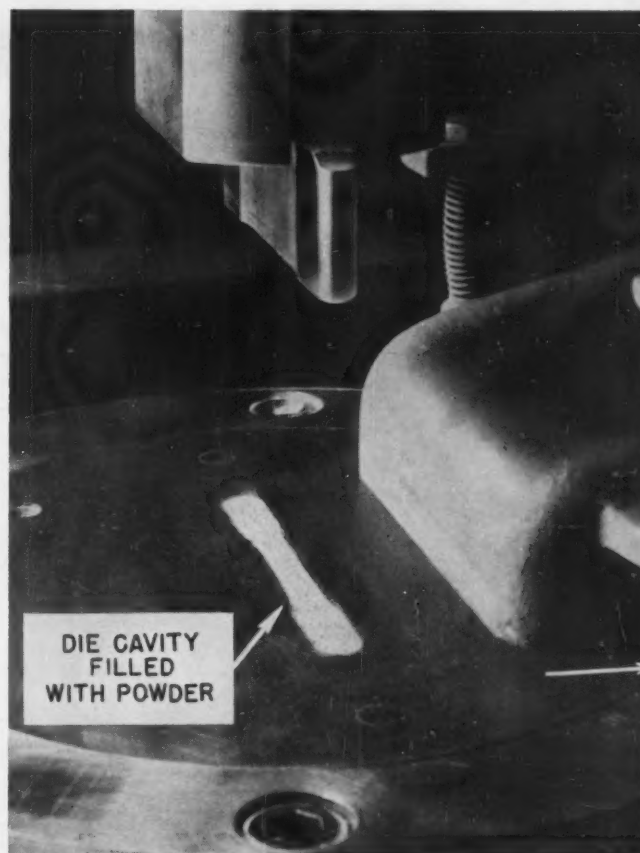


Fig. 4. The feed-shoe, seen between the punch and the table, serves to fill the die cavity with powder, then later to sweep the compact off the table.

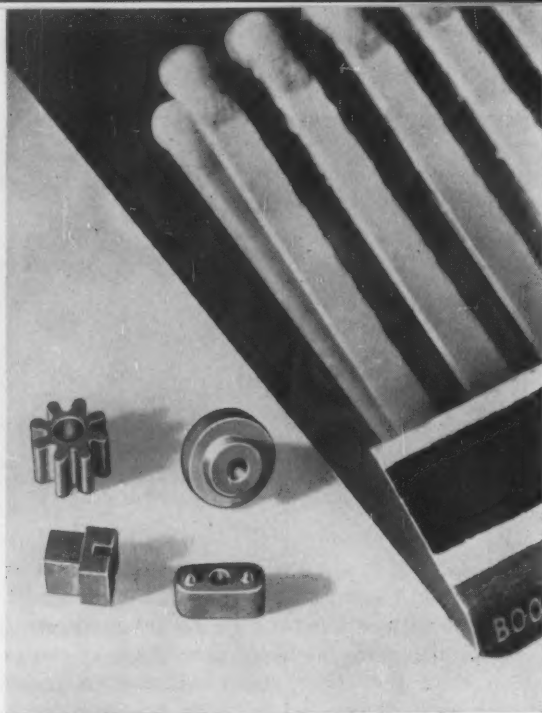


Fig. 5. The brass-powder parts appear very small, even when magnified next to a book of matches.

pared to wrought brass, the strength, hardness, and wear resistance of the powder parts more nearly approach those of dead-soft, annealed stock than those of cold-worked stock. However, it is possible to approximate the properties of wrought brass by subjecting the work to an additional pressing operation.

Variations in the mechanical properties of four different brass-powder compositions are exhibited in Table 2. Powder number designations are those of the New Jersey Zinc Co. All of these powders can be pressed with high densities. The leaded 80-20 brass with phosphorus added (powder 1178) has the highest ductility, and the 70-30 brass (powder 1101) the lowest. Powder 1109, an 85-15 brass, and powder 1178 are somewhat softer than the others. Powder

Fig. 6. Typical of the applications of brass-powder metallurgy to the electronics industry are the two parts identified in this radio transmitter driver grid.

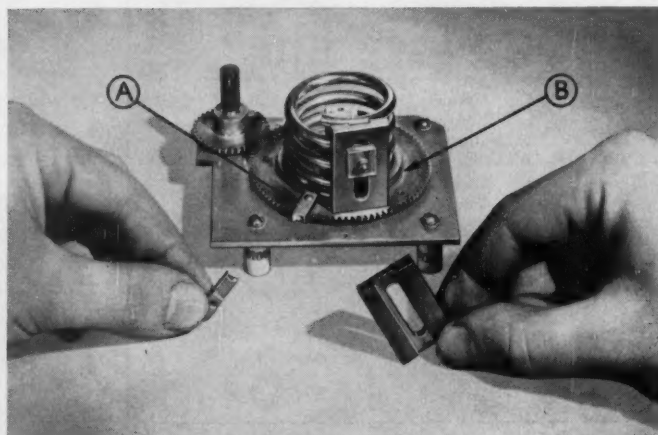


Table 2. Properties of Four Brass Powders

Powder Number	1101	1109	1163	1178
Composition, Per Cent				
Copper.....	70	85	78.5	78.5
Lead.....	1.5	1.5
Phosphorus.....	0.25
Zinc.....	30	15	20	19.75
Optimum Sintering Temperature, Degrees F.....	1615	1615	1615	1615
Sintered Density (87 to 91 Per Cent of Theoretical), Grams per Cubic Centimeter.....	7.3 to 7.6	7.6 to 7.9	7.5 to 7.8	7.5 to 7.8
Mechanical Properties				
Compacting Pressure, Tons per Square Inch.....	30	28	28	31
Tensile Strength, Pounds per Square Inch.....	26,800	26,800	27,400	28,800
Elongation, Per Cent in 1 Inch.....	8	12	12	24
Hardness, Rockwell H.....	80	74	81	71
Density as Compressed, Grams per Cubic Centimeter.....	7.16	7.51	7.37	7.41
Change in Length, Per Cent.....	-1.96	-1.27	-1.70	-1.65
Change in Weight, Per Cent.....	-1.94	-1.11	-1.39	-1.20

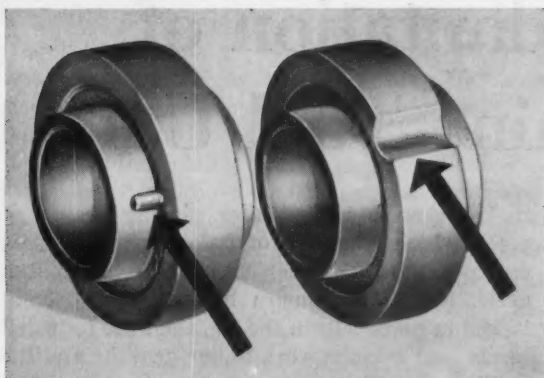


Fig. 7. The key and key notch required preclude the production of these parts from bar stock.

1109 shows the least shrinkage, and powder 1101 the most. Change in weight seems to vary with the amount of zinc present.

Applications of brass-powder parts appear in many fields, such as hardware manufacture and in the electronics industry. Brass is the traditional hardware metal, and until fairly recently, sand casting was the most economical method of producing such parts as lock cylinders. These cylinders are still brass, but they are now made from powder at much lower cost. Table 3 is a list of the operations formerly required in producing the lock cylinder as a brass sand casting. Those operations that are starred (*) are eliminated now that the cylinders are made from brass powder. Secondary operations are reduced from twenty-three to eleven, with a total saving of 35 per cent in man-hours. What machining is necessary is performed without difficulty because a leaded brass powder is used. Additional economies are realized, by the lessening of rejects and tool breakage.

The electronics industry leans toward brass because of its strength, corrosion resistance, high melting point, bearing properties, and color. A case in point is the radio transmitter driver grid, Fig. 6, containing the 90-10 brass-powder parts A and B. The larger part requires only the drilling and tapping of two end holes prior to plating for assembly. Production of the smaller part requires only the drilling of one hole. Tolerances for both parts are plus or minus 0.005 inch.

Two views of a gear and cam hub are shown in Fig. 7. Were it not for the key and the key notch (indicated by the arrows) the components

Table 3. Operations Required for a Sand-Cast Lock Cylinder

1. Make cores	14. Ream pin-holes
2. Mold	15. Ream plug hole
*3. Chop off	16. Disc pin-holes
*4. Grind face and back	17. Stake pin-holes
*5. Rough-ream plug hole and rough-cut to length	*18. Finish-ream plug hole
*6. Semifinish-ream plug hole	*19. Clean counterbore for plug seat
*7. Rough-bevel	20. Broach for mushroom drivers
*8. Rough-face	21. Finish-cut to length
*9. Counterbore plug seat	*22. Finish-face, turn outside diameter and bevel
*10. Mill for spot and bar cut	23. Finish-ream and counterbore
11. Drill pin-holes	24. Polish
12. Ream plug hole	*25. Stamp "Yale"
13. Drill, countersink, and tap two ear holes	

*These operations are eliminated when lock cylinder is made of brass powder.

could be readily machined from bar stock. As it is, they are pressed from brass powder to final shape and dimensions without secondary operations. Here, the product designer used powder metallurgy to avoid prohibitive machining costs.

Another common application is found in the dial mechanism of telephones. The brass-powder parts, Fig. 8, control the rotational speed of the dial. Here, both weight and dimensions must be closely controlled to assure proper functioning of the mechanism.

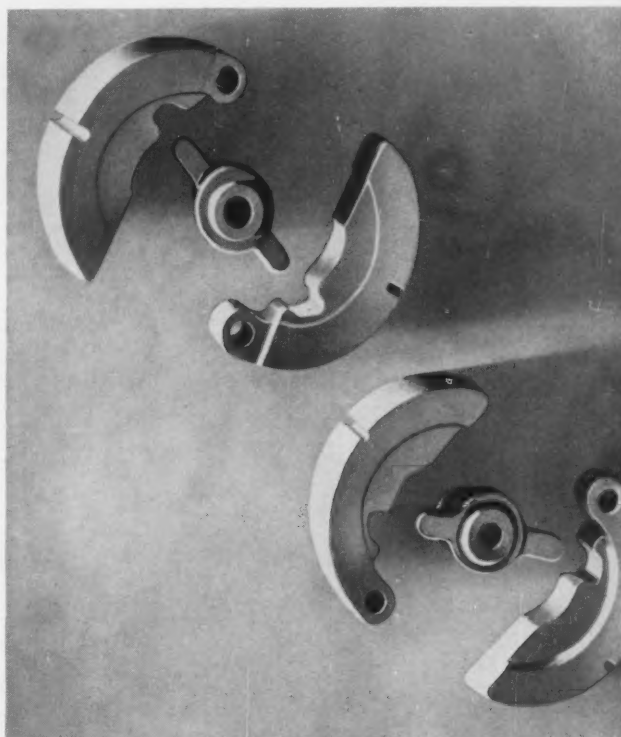


Fig. 8. Precise as to weight and dimension, these brass-powder parts control the rotational speed of telephone dial mechanisms.

Ingenious Adaptation of Standard Machine Tool Units

AN unusual idea in the application of conventional machine tool components is embodied in the design of a multiple-unit drilling machine being used in the manufacture of two models of "Beacon" cameras. Production requirements for these cameras, being turned out by Whitehouse Products, Inc., Brooklyn, N. Y., were sufficiently large to rule out the practicability of single drilling procedures, but not great enough to warrant the use of special high-production machine tools. It was for this reason that company engineers planned the unique machine now being used, which consists basically of nine 14-inch high-speed Delta drill-press heads in a multiple-unit arrangement.

Although considered as a single machine tool, this drilling set-up consists of three separate units that can be operated either individually or collectively. The first unit is made up of four drill heads that drill sixteen holes simultaneously

in the camera body. After placing the work-piece, which is molded of Bakelite, in a jig, the operator moves a lever to initiate the drilling cycle. First, the camera body is hydraulically locked in place within the jig, then the four drill heads feed into the work to perform the multiple drilling operations.

Drill head No. 1, at right of the unit, Fig. 1, has ten spindles. Each spindle contains a 0.049-inch diameter drill that is fed into the work to a depth of 3/16 inch. These holes, which are held to a location tolerance of 0.0015 inch, permit assembly of the shutter mechanism to the camera body.

Drill head No. 2, at the left of the unit, is equipped with three spindles that drill 0.079-inch diameter holes, also to a depth of 3/16 inch. These holes accommodate the fasteners for the hinge to which the back camera cover will be joined. At the top of the unit, positioned similarly to a standard drill press, is head No. 3. Being equipped with two spindles, two 0.125-inch diameter holes are drilled through the body to receive eyelet studs that serve as locks for the back cover.

Located at the rear of the unit, in a horizontal position, is drill head No. 4. This head drills and countersinks a 1/4-inch diameter hole in the bottom surface of the camera body to permit the use of a tripod. The production rate for this machining sequence, which takes place automatically in a single operation, is 300 pieces per hour.

The second unit of the machine handles the back cover that is used on both camera models. It consists of two heads and drills five holes simultaneously. Here, again, the operation is completely automatic, with the exception of loading and unloading. When the starting button is pressed, the work-piece is automatically positioned and locked in place.

Drill head No. 1 is situated directly above the jig, Fig. 2, and is equipped with three spindles, all drilling 0.079-inch diameter holes to a depth of 3/16 inch. These holes will be used to join the hinge to the cover. At the second drill head, located at the right of the jig, two 1/8-inch



Fig. 1. Sixteen holes are drilled simultaneously in the body of a camera on the first of three units of a company-engineered production drilling machine.

diameter holes are drilled through the part to facilitate riveting of a lock assembly. The production rate for this combined drilling operation is 450 pieces per hour. This operation is applicable to both types of cameras by merely interchanging the holding fixtures.

To machine the flash attachment used with both camera models, the third unit of the machine is brought into use. This unit includes three drill heads which handle a total of eight holes and one deburring operation simultaneously.

Drill head No. 1, at the right of the jig, Fig. 3, has three spindles. Two of the holes drilled are for electric contacts, and the third is for a mounting hinge. The second drill head performs the identical operation on the opposite side of the flash-gun body. Head No. 3 drills two holes through the fastening device and, at the same time, deburrs a 1 1/4-inch diameter reflector mounting hole. A total of 600 pieces per hour are drilled and deburred by this third unit of the drilling machine.

Fig. 2. Back camera cover is drilled on the second unit of a multiple drilling machine. This unit incorporates two high-speed drill-press heads.



High-Frequency Resistance Welding Proves Flexible and Versatile

A high-frequency resistance tube-welding technique introduced by the New Rochelle Tool Corporation, New Rochelle, N. Y., was recently unveiled at the tube mill of the Abbey Etna Co., Toledo, Ohio. Several hundred representatives of metal fabricating companies observed the use of a highly flexible and versatile welding tool applied to the production of continuous seams.

In the "Thermatool" technique, effects of high-frequency reactance are used to direct and pin point current into the metal edges being joined. At the Ohio mill production was changed from one metal to another with only minor adjustments in the welding and forming facilities. Untreated hot- and cold-rolled steel, stainless-steel, copper, aluminum, and brass were all welded with excellent results. Flare and flexing tests proved the welds to be equal in strength to the parent metal, and energy concentration greater than that of other heating means is claimed.

Fig. 3. Three drill-press heads, designed into a single unit, drill eight holes and perform a deburring operation at the same time on a flash attachment.



Gearing Gobbledygook

Double talk on gear drawings will not survive if mechanical and verbal logic is applied to specifications and nomenclature

By LOUIS D. MARTIN, Gear Engineer
Rochester, N. Y.

GOBLEDYGOOK, a word coined by a Texas politician to describe a confusing jargon of words or double talk, has infiltrated the field of gear design. To illustrate some of the prevalent double talk that may be found in gear specifications today, a few typical examples, chosen for their diversity rather than for their lack of clarity, will be described. They are representative of hundreds of similar cases that could be gathered from all segments of the gear industry.

The first example, illustrated in Fig. 1, concerns a spur gear made by one of the largest companies in this country. The pertinent data is the same as that appearing on the original drawing. There are at least four major errors, the specifications for which have been indicated by encircled numbers.

While the gear has an even number of teeth, the wires are not shown diametrically opposite to each other as indicated at encircled 1, although the given wire measurement of 3.2743 inches-3.2718 inches requires the measurement to be taken on a line passing through the center of the gear.

In the notation at encircled 2, "P.D. of gear to be concentric with bore within .001 T.I.R.," there is the inconsistent requirement of 0.001-inch total indicator reading when the bore

tolerance is also 0.001 inch as shown at encircled 3. Obviously, the gear cutting arbor must be made 0.0001 or 0.0002 inch under the minimum bore tolerance so all the allowable eccentricity can be used up by the bore tolerance. If a gear shaper is to be used to produce the gear, there is no allowance specified for cutter run-out of the work-arbor or for blank deflection. A more realistic bore tolerance would have been 0.005 inch.

Finally, the specification for the circular tooth thickness on the standard pitch diameter is 0.0982 inch as shown at 4. There is no tolerance for this dimension although it happens to be the nominal tooth thickness. To have been consistent, this dimension would have to be either marked with a reference specifying it as a standard gear or given a tolerance which would have agreed with the wire measurement tolerance.

All this gobbledygook could have been avoided by the notation "AGMA Precision Class 1." This simple reference would have been sufficient to specify the amount of permissible total composite error; give the desired tooth thickness reduction; indicate the blank tolerance required to produce the desired gear quality which would have also indicated the bore tolerance; and give the quality specification for the master gear used to check the total composite error.

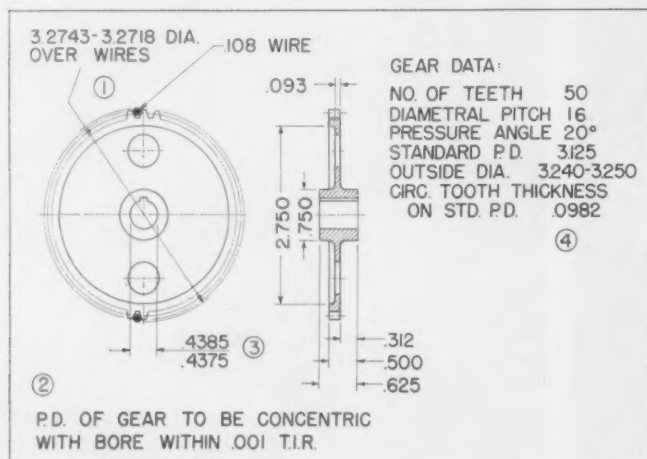


Fig. 1. Four errors on this spur gear drawing concern wire measurement, bore tolerance, run-out total indicator reading, and tolerance for the circular tooth thickness.

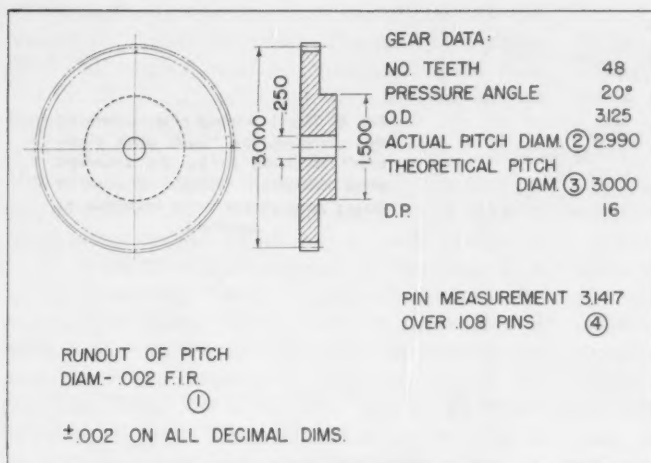


Fig. 2. A confusion of nomenclature, absence of tolerances on essential dimensions, and errors in calculation put this drawing in the double-talk class.

In the next example, Fig. 2, there are also four errors. The run-out allowed for the pitch diameter is 0.002 inch "F.I.R." as indicated at encircled 1. The first drawing correctly specified "total indicator reading," whereas this one calls for "full indicator reading."

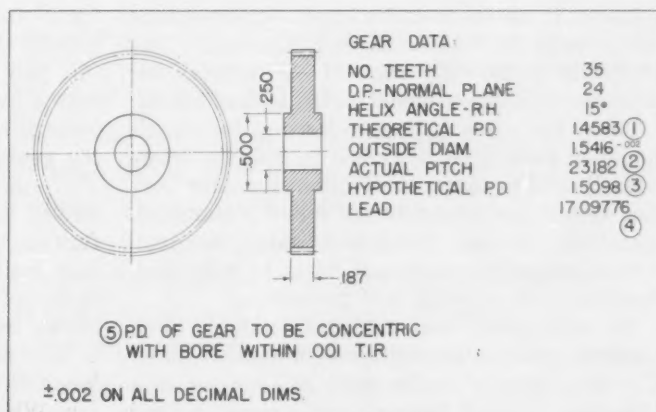
The terms "actual pitch diameter" at encircled 2 and "theoretical pitch diameter" at encircled 3 are confusing. Apparently the designer meant the theoretical pitch diameter to be the standard pitch diameter, and what he calls "actual pitch diameter" is, quite likely, meant to be the testing diameter. Somewhere along the line his pencil slipped because the measurement given is 0.010 inch under nominal. This would agree with the actual pitch diameter of 2.990 inches if it were not for the fact that the measurement over pins at encircled 4 is not proportional to the testing diameter reduction for 48 teeth but is, in reality, considerably greater. The designer apparently did not know about the K_m thickness factor given in the pin measurement standards developed by the American Gear Manufacturers Association.

The absence of tolerances on all essential di-

mensions seems to imply that the stated general tolerance of plus or minus 0.002 inch on all decimal dimensions would have general application. If such were the case with a bore tolerance of 0.004 inch, it would be quite difficult to hold the run-out tolerance of 0.002-inch total indicator reading. The only way to clarify the puzzle was to communicate with the designer to learn what he really had in mind.

A "hypothetical" pitch diameter, something new in gear nomenclature, is introduced in the drawing shown in Fig. 3. In unscrambling the confusion of the nomenclature and specifications, it was finally determined by the designer that the "theoretical pitch diameter" of 1.4583 inches is really the pitch diameter of a 35-tooth spur gear of 24 diametral pitch. The so-called "actual pitch" of 23.182 is really the transverse diametral pitch. The "hypothetical pitch diameter" is the pitch diameter in the plane of rotation and is equal to 35 divided by 23.182. The lead of 17.09776 inches is computed on the theoretical pitch diameter for a spur gear of 24 diametral pitch. The usual note requiring the "P.D. of gear to be concentric with bore within .001 T.I.R.

Fig. 3. A "hypothetical pitch diameter" has been innovated on this drawing. The theoretical pitch diameter, actual pitch, and lead are also in error.



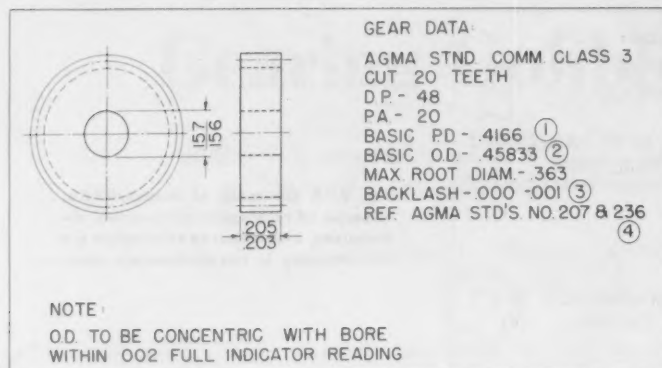
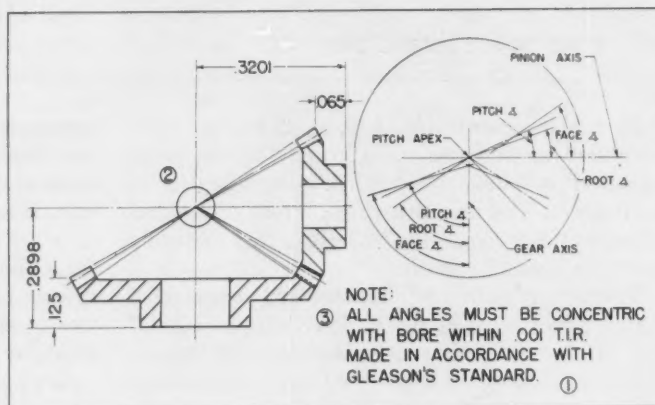


Fig. 4. (Left) Among other errors on this drawing, the "basic pitch diameter" is found to be the standard pitch diameter. Without a mate a single gear cannot have backlash, as specified.

Fig. 5. (Right) Although reference is made to Gleason standards, the designer of these gears did not live up to them. More interest was shown in cone concentricity than the functional surfaces of the gears.



T.I.R." is included, and one is prompted to ask, "Which pitch diameter are they talking about?" Note also the absence of tolerances on this drawing.

A milder form of double talk, shown in Fig. 4, demonstrates another concept of pitch diameter. The term "basic pitch diameter" is really the standard pitch diameter, found by dividing 20 by 48. The basic outside diameter is inconsistently given to the fifth decimal place.

Tolerance for backlash in a single gear should not be specified because backlash is the play between meshing gear teeth and, until a single gear is meshed with another at a given center distance, it cannot have backlash. An erroneous reference to AGMA standards is also made. The draftsman apparently ran out of numbers because the references should be 207.03 and 236.02.

Thus far, five different terms for pitch diameter have been described in specific drawings. Fourteen concepts of pitch diameter that the writer has encountered follow: standard, operating, testing, transverse, axial, nominal, virtual, reference, calculated, basic, hypothetical, imaginary, generating, and measuring.

To state that one diameter, like a pitch diameter, must be concentric with another diameter or a bore is double talk. A diameter is a dimension through the center of a circle, conical

section, or cube. It is a linear distance like a yard or a mile. How can a distance or a length have concentricity?

Within the last ten months over 1200 references were found by the writer stating that diameters were required to be concentric with each other. Most of them appeared on gear drawings. This is double talk when speaking of gears. What is really meant is that a given circle like an addendum circle may not be eccentric with the axis of rotation or bore by a certain number of thousandths of an inch. This may be expressed as run-out total indicator reading, if desired.

The drawing of a pair of bevel gears illustrated in Fig. 5 has at least three errors. The note by the draftsman at encircled 1 states that this pair of bevel gears is made in accordance with Gleason standards. However, you will observe that all the angular elements of the meshing gears, like face, root and pitch-cone angle, converge at a common point as indicated at encircled 2. In the latest bevel-gear system the face angle of one member is made parallel to the root angle of its mate and therefore converges inside of the pitch-cone intersection point, as shown in the inset.

The fine-pitch bevel-gear standard has followed this practice since its inception six years ago. While the numerical values on the drawing

are correct, it appears that the draftsman did not catch this subtle point. The note also states that "all angles must be concentric with bore within .001 T.I.R." Can you even imagine angles being concentric?

Apparently the designer of these gears thought it was more important to obtain concentricity of the face, root, and back cones than to give adequate specifications on such things as tooth bearing, desired amount of backlash at a given mounting distance, and total composite error. Who cares whether or not the root and face cones run out with the bore as long as the run-out is not excessive? They are, after all, non-functional surfaces. The more important considerations in bevel gears are nature of contact, desired backlash, and profile bearing.

The company that designed these gears lost over \$7000 in gears that did not perform satisfactorily. If the drawings had not been cluttered with double talk, and if the designer had read the Gleason standards and bevel gearing literature carefully, this loss might have been avoided.

A number of examples of face gears being mistaken for crown gears and vice versa have been brought to my attention. A crown gear, as defined by AGMA classifications, is a bevel gear in the form of a disc, having a plane pitch sur-

face. The crown gear corresponds, in bevel gears, to the rack in spur gears. It is a member of the bevel-gear family and mates with other bevel gears, not spur pinions. On the other hand, a face gear consists of a spur or helical pinion that mates with a conjugate gear of disc form. The axes of the pinion and gear are usually at either intersecting or offset right angles.

Specifications for the worm shown in Fig. 6 leave a great deal to the imagination. There are at least five errors in this drawing. First, the pressure angle of 29 degrees is given as the included angle of the tooth, which is obviously wrong. The tooth could lean one way or another and still meet the drawing specifications. Second, the ".125 pitch" is apparently the axial pitch. This may be deduced from the statement "8 threads per inch (R.H.)." The pitch should have been labeled "axial."

Third, the helix angle should have been called "lead angle" to conform with AGMA nomenclature. Fourth, in the enlarged view of the tooth cross-section a specification showing whether the section is in a normal or axial plane is missing. Finally, while it is evident that the section is through the axial plane, the whole depth of 0.0855 inch and top land 0.0418 inch are correct for the normal plane.

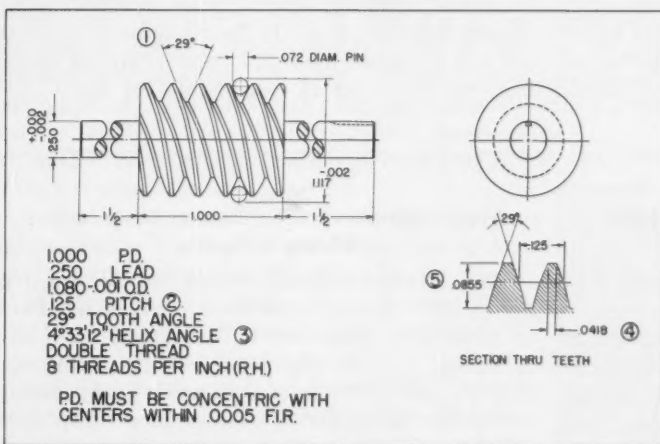


Fig. 6. (Left) On this worm drawing the pressure angle, helix angle, and pitch are in error.

Fig. 7. (Right) Information form used for worms of AGMA Standard Fine Pitch is a concise method of giving required specifications.

NO. OF THREADS 2 OUTSIDE DIAM. 1.080⁻⁰⁰²
 NORMAL PITCH .1246 STD. P. DIAM. 1.000
 AXIAL PITCH .125 OPER. DIAM. 1.000
 LEAD .250 TESTING DIAM. .999⁻⁰⁰¹
 LEAD ANGLE-HAND 4° 33' R.H.
 CLASS: (COMMERCIAL)(PRECISION) (1)(2)(3)(4)(A)(B)(C)(D)
 NORM. PRESS. ANGLE AND DIAM. OF WHEEL OR
 CUTTER FOR PRODUCING WORM 1 1/2 DEG. 20 DIAM. WHEEL
 MATES WITH PART NO. D-8615 AT XXXX C.D.

BEVEL GEAR DATA		
BASIC SPECIFICATIONS	NUMBER OF TEETH	
	DIAMETRAL PITCH	
	PRESSURE ANGLE	
	SHAFT ANGLE	
	PITCH ANGLE	
	ADDENDUM WHOLE DEPTH ROOT ANGLE	
	MAXIMUM CALCULATED CIRCULAR THICKNESS ON STANDARD PITCH CIRCLE	
	NUMBER OF TEETH IN MATING GEAR	
	MATING GEAR PART OR CONTROL GEAR NUMBER	
	CHORDAL ADDENDUM	
	CHORDAL THICKNESS	

Fig. 8. Minimum specifications form recommended for fine-pitch bevel gears. Every type of fine-pitch gearing is being included in this program.

A concise specification form used for worms at the Eastman Kodak Co. for the past five years is shown in Fig. 7. The pressure angle of the worm itself is not specified, but instead, the pressure angle put on a grinding wheel or cutter of a given diameter is given. This is a practical method of specifying worm profile. In the production of worms, the profile produced is dependent on the size and shape of the cutting tool or grinding wheel.

One thing being done to clarify specifications is the development of information sheets for fine-pitch gearing. The standard form for bevel gears is shown in Fig. 8. There is a different form for each type of gearing. These forms

should be either printed on drawings or transferred to them with a rubber stamp. Such a program, extended to cover all types of coarse- and fine-pitch gears, can do much to standardize procedure and nomenclature.

Gearing gobbledygook will not be eliminated by any panacea. Individuals in the gear industry should live up to the principles of accepted gearing standards, preach the gospel of clarity among professional associates, emphasize the destructiveness of double talk, and keep abreast of the latest technical literature on gearing. They should certainly make it their business to point out any errors or ambiguity appearing on drawings to whomever is responsible for them.

Flame-Plating with Tungsten Carbide Cuts Costs 70 Per Cent

By "Flame-Plating" sewing-machine feed dogs with a thin coating of tungsten carbide, factory operators are realizing a 70 per cent saving in costs. Tests have shown that steel feed dogs have an average life of about one month when used on highly abrasive materials such as burlap or canvas. The tungsten carbide coating applied by Linde Air Products Co., a division of Union Carbide & Carbon Corporation, New York City, extends the service life of feed dogs to as much as six times that of uncoated parts.

In the "Flame-Plating" process, finished or semifinished parts can be coated without danger of dimensional or metallurgical change because the temperature of the base metal does not exceed 400 degrees F. during coating. The coating may be left in an as-coated condition of about 125 micro-inches r.m.s., as in the case of the sewing-machine feed dogs, or finished to 1 to 5 micro-inches r.m.s.

American Steel Warehouse Association Elects Officers

The American Steel Warehouse Association announced the election of its new president, Paul O. Grammer, president of Grammer, Dempsey & Hudson, Inc., Newark, N. J., during the organization's forty-sixth annual meeting held recently in Boston, Mass. Mr. Grammer succeeds Walter S. Doxsey, who is retiring. Other officers elected for the coming year are: Lester Brion, Peter A. Frasse & Co., Inc., New York City, and M. R. Lowenstine, Jr., Central Steel & Wire Co., Chicago, Ill., vice-presidents; and C. L. Hardy, Joseph T. Ryerson & Son, Inc., Chicago, Ill., treasurer.

Veteran industry leaders were honored for their many years of active participation in the steel distributing industry. Ainslie Y. Sawyer, retired vice-president of Joseph T. Ryerson & Son, Inc., was presented with an honorary membership certificate in recognition of his contributions to the Association over the past twenty-five years.

From Planer to Skin-Milling Machine

ONE of the largest machine tool conversions ever undertaken has transformed a thirteen-year-old Betts pit type planer into a modern 450,000-pound skin-milling machine equipped with a system of electric and hydraulic controls. The conversion was carried out for North American Aviation, Inc., by Simmons Machine Tool Corporation, Albany, N. Y.

Integrally stiffened wing skin panels for the F-100 Super Sabre jet fighter plane will be sculptured from either plate stock or rough-forged slabs of 7075-T (75S-T) aluminum. Although the machine has been designed to handle two wing panels simultaneously, provision has been made for additional tooling to mill as many as five leading edge skins held on five separate vacuum chucks. Maximum work-piece size that can be accommodated on the skin-milling machine is 18 by 25 feet.

Replacement of the original single-point tooling with two 60-H.P. Onsrud milling heads permits the use of spindle speeds up to 3600 R.P.M., removing as much as 250 cubic inches of metal per minute. Specially designed carbide-tipped cutters mounted on the milling heads are 2 inches wide and 14 inches in diameter. The longitudinal cutting feeds vary from 20 to 150 inches per minute with transverse cutting feeds varying from 5 to 62 inches per minute. Diagonal cutting facilities are provided, thereby necessitating the accurate coordination of both longitudinal and cross feeds.

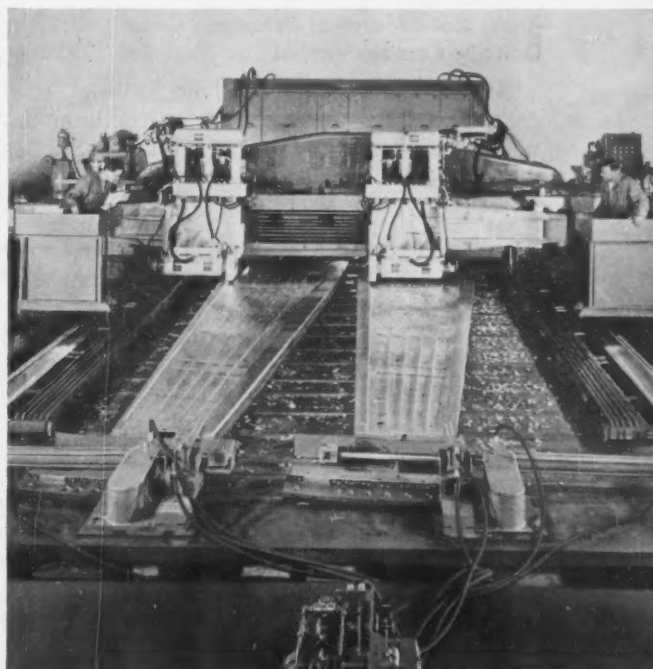
A cross-slide indexing arrangement provides for automatic location of the cutting tools. Accuracy requirements as close as plus or minus 0.001 inch can be held. Being tapered along their length, the wing skin panels are machined in a series of convergent lengthwise cuts. Because of this, the panel must be periodically pivoted on the machine table. This is done by a hydraulically actuated vacuum-chuck indexing mechanism located at the front of the machine. After a group of cuts have been completed, the indexing mechanism automatically pivots the holding chuck in a horizontal plane. In this way, the ensuing group of cuts will be directed along the desired path.

Rise and fall of the milling heads are controlled hydraulically by a tracing device consisting of a follower attached to the machine gantry and

a laminated template running the length of, and adjacent to, the work-piece. A separate template and follower are provided for each milling head. In operation, the follower rides on a single lamination of the template, each lamination representing one cutting pass on the work-piece. Appropriate lobes on each template lamination determine the sculptured form of the wing skin panel.

An anticipator precedes the follower as it travels along the template. The purpose of this device is to foresee the rise and fall to be transmitted to the milling head, and to slow the feed to a range of 15 to 20 inches per minute on the descending cuts. Two sets of passes are required to complete the panel, one roughing and one finishing. During the roughing operation the milling heads are permitted to take a depth of cut of approximately 1 5/8 inches.

A feature of this machine is the control set-up employed. Two pulpits are used, one mounted at each end of the gantry and moving with it. Sixty controls arranged in banks, including multi-colored flashing indicators, are located on consoles within the pulpits and keep tabs on the operation of the machine. Either one, or both, of the milling heads can be controlled from each pulpit, keeping the number of required operators to a minimum.



Two aluminum-alloy slabs being machined simultaneously to form integrally stiffened wing sections for F-100 Super Sabre jet airplanes. This skin-milling machine was converted from a thirteen-year-old planer.

Materials OF INDUSTRY

The properties and new applications of materials used in the mechanical industries

Hard-Facing Alloy Available in Welding Rod Form

A low hydrogen hard-facing alloy is available for application to working surfaces of construction, mining and aggregate handling machinery, and similar heavy-duty equipment where impact and wear resistance are required. It has been brought out by Wall Colmonoy Corporation, 19345 John R St., Detroit 3, Mich. The alloy, known as "Colmonoy No. 2," is a chromium-molybdenum-silicon alloy which can be deposited on manganese and other steels from an AC-DC welding electrode. It can be used to extend the life of such equipment components as tractor treads, dipper teeth, muller tires, and scraper knives, to mention a few. As deposited, it has a hardness of 50 to 55 on the Rockwell C scale following the first pass and 55 to 60 after the second. Tensile strength is about 75,000 pounds per square inch and its specific gravity is 7.6. Available sizes include 1/8-, 5/32-, 3/16-, and 1/4-inch diameter electrodes.

Resin Core Material Whose Density Can be Varied

A high-strength, light-weight material, used for structural core applications has been announced by Rezolin, Inc., 5736 West 96th St., Los Angeles, Calif. This liquid phenolic resin, known

as "Corfoam 114," will foam to a hard consistency at ambient room temperature. The density is controlled by the amount of foaming agent used. It exhibits a compressive strength of 37 pounds per square inch for a 3 pound per cubic foot density and 1100 pounds per square inch for a 21 pound per cubic foot density.

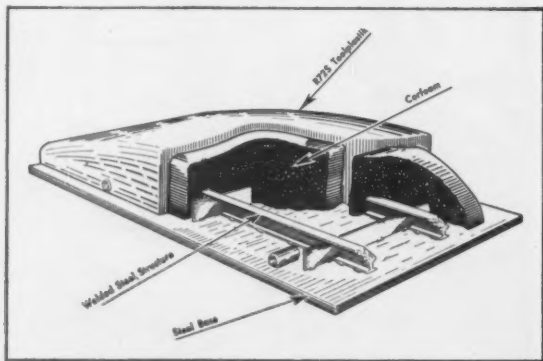
This material is used for making cores for stretch dies, jig dies, check fixtures, and models, where applicable. The accompanying illustration shows how Corfoam may be used in making a typical stretch-press die. It will be noted that this die consists of a normalized welded steel base onto which the Corfoam and its solid plastic working face are affixed.

Reinforced Fiberglass for Industrial Tooling Applications

Fixtures, templates, and jigs of all kinds can now be made with an industrial grade of reinforced fiberglass. This announcement has come from the Strick Plastics Corporation, 31-06 38th Ave., Long Island City, N. Y. This material, called "Lamicor," has a flexural strength of 37,700 pounds per square inch, a compressive strength of 35,200 pounds per square inch, and a tensile strength of 27,700 pounds per square inch. According to the manufacturer it can easily be fabricated into special shapes. It is a fire-resistant material which is easily cleaned, has a power factor of 0.03 at 60 cycles or 0.01 at 1 megacycle for electrical applications, and transmits 1.7 Btu per inch per degree F. per square foot per hour.

Open-Gear Lubricant for Application on Highly Loaded Gears

An open-gear lubricant for highly loaded gears which normally can only be lubricated infrequently has been announced by The Alpha Molykote Corporation, 65 Harvard Ave., Stamford, Conn. "Molykote 165X," as it is called, is a near colloidal dispersion of molybdenum disulphide in a viscous, tacky, and adhesive petroleum oil which has been rendered fluid by the addition of a volatile, non-flammable diluent.



Typical stretch-press die construction using a variable-density phenolic-resin material called "Corfoam 114."

An eccentric shaft is being given a 7/16 inch finishing cut with a feed of 0.015 inch feed per revolution at a speed of 360 feet per minute using K21—a multi-purpose sintered carbide produced by Kennametal, Inc.



The evaporation of the diluent leaves a plastic film that does not tend to hold dust and resists being washed off by water. The film will not crack or peel off at temperatures as low as 0 degrees F.

This lubricant is particularly useful where only one or two gears of a long train are exposed and the lubrication of the entire train must be achieved through the transfer of lubricant from one gear to another. It is recommended for construction machinery, elevator and escalator gear trains, and mechanical presses and power shears. It may be applied by brushing, pouring, drop-feed cups, spray gun, or mechanical force-feed lubricators.

Multi-Purpose Carbide Cutting Material Facilitates Production

A multi-purpose sintered carbide steel-cutting material, designed for high productivity on both high- and low-speed machines through wide ranges of applications, has been announced by Kennametal Inc., Latrobe, Pa.

The material, called "K21," has a hardness of 91.5 on the Rockwell A scale, and a high transverse rupture strength. Its high edge strength, combined with good wear qualities and resistance to cratering, make its use on plunge and interrupted cutting of castings, having sand inclusions and hard spots, particularly effective. The material is available in blank, tool, and insert form.

The accompanying photograph illustrates a typical application of this sintered carbide cutting material. The carbide is used for both the rough and finished machining of an eccentric

shaft (1 inch off center). Both cuts were 7/16 inch per side with a feed of 0.015 inch per revolution. The first cut was at 310 feet per minute and the second at 360 feet per minute.

Graphite Paste that Prevents Seizing and Provides Sealing

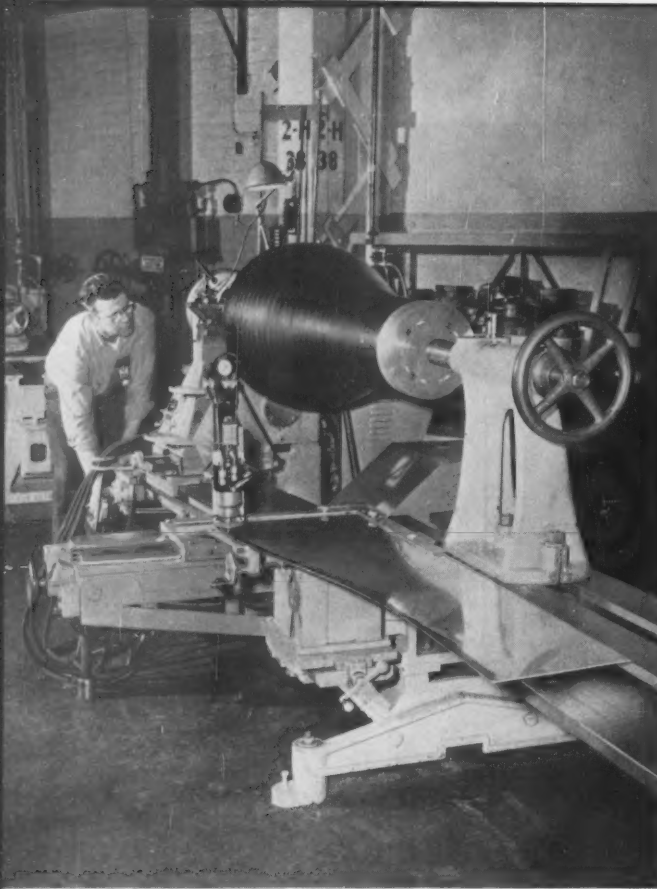
A graphite product known as "dag" Dispersion No. 217 that prevents seizing and provides sealing has been announced by Acheson Colloids Co., Port Huron, Mich. This ready-to-use paste of semicolloidal graphite in a special carrier was developed specifically as an anti-seize and sealant for high-pressure oxygen systems where line pressures reach 2000 pounds per square inch. It possesses anti-seize properties at temperatures ranging from 169 degrees F. to minus 65 degrees F. It is non-flammable even in the presence of high-pressure oxygen at temperatures of 575 degrees F. and higher.

Synthetic Wax Lubricant for Tight-Fitting Metal Parts

A finely powdered synthetic wax lubricant, which can be used to lubricate very tight-fitting parts such as screws threaded in metal, has been announced by Glyco Products Co., Inc., Empire State Building, New York 1, N. Y. "Acrawax C Atomized," as this lubricant is called, is a non-tacky, non-corrosive lubricant with a melting point of 285 degrees F. It is insoluble in water, oil, and solvents and is also a good dielectric. Application is made by dusting or by dipping into it the parts to be lubricated. Any small amount held on the surface of the metal is sufficient to provide the proper lubrication.

In Shops Around the Country

Camera highlights of some interesting operations performed in various metal-working plants throughout the nation



A spinning lathe performs a turning operation at the El Segundo, Calif., Division of the Douglas Aircraft Co. This lathe turns a large spinning chuck of laminated Masonite, by means of a True Trace hydraulic duplicator. The duplicator follows the contour of a flat template which is aligned with the lathe by means of the transit seen on the headstock.

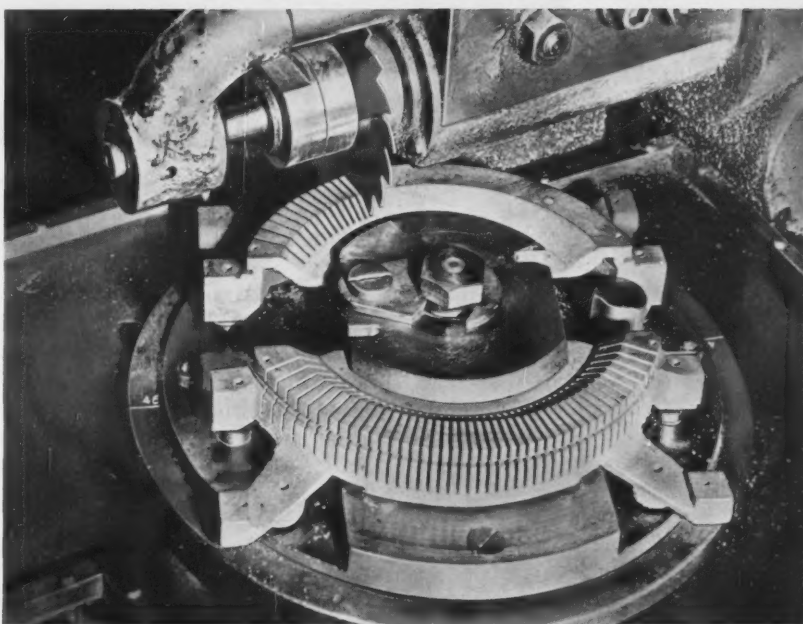


Grooving a 32,000-pound rotor for one of the world's largest steam turbine generators at the General Electric Co., Schenectady, N. Y. The new unit, to be installed in the Detroit area, is of cross-compound, double-flow, reheat design. Over 830,000 tons of coal per year will be needed to provide the steam. The rotor is for the high-pressure element of the generator.

Planing normalized boiler plate at Hydraulic Press Mfg. Co., Mount Gilead, Ohio. The operation consists of removing $7/16$ inch of stock from both sides of 9-foot long plates. A Kennametal K2S 1 $1/4$ -inch carbide round insert cutter is used, and only two passes are required per side—a $3/8$ -inch deep rough cut, and a $1/16$ -inch deep finish cut. Cutting speed is 218 surface feet per minute.

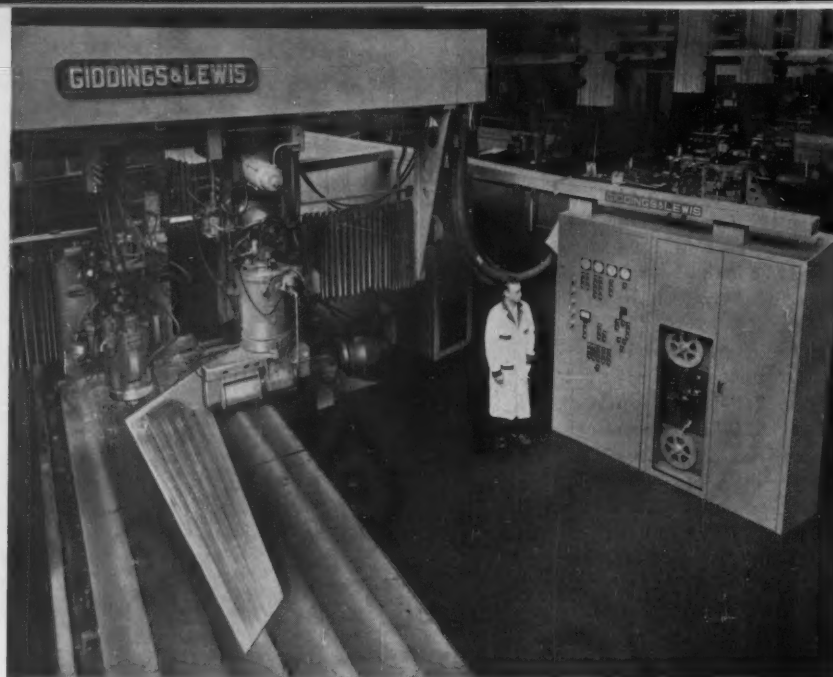


Cutting precision slots in cast-iron segments for typewriters at Smith-Corona, Inc., Syracuse, N. Y. The saw, designed by the Gay-Lee Co., with Carboloy 883, is 3 $1/2$ inches in diameter and operates at 640 surface feet per minute. The slots are cut in sequence on a Producto milling machine containing an integral indexing mechanism.



Assembling plastic ventilating grilles of tape recorders with the use of a Chicago Pneumatic "Magna-matic" screwdriver. A new one-slot magnet clutch in the air tool delivers proper torque to the self-tapping screws, eliminating possible distortion of the grille. Used at three points in the assembly line, these tools have stepped up production 25 per cent.





Control Tape Prepared from Numerical Data

Magnetic tape—prepared electronically, directly from numerical data—is being used to automatically control a Giddings & Lewis spar- and skin-milling machine. Cams or templates are not required, less skilled machine operators can be employed, and tapes can be stored for future production needs

By EDGAR L. McFERREN,
Vice-President—Engineering
Giddings & Lewis Machine Tool Co.,
Fond du Lac, Wis.

ACCURATE milling of intricately contoured work-pieces is performed completely automatically with magnetic tape control on the spar- and skin-milling machine seen in the heading illustration. Entire work cycles can be programmed on the tape solely from numerical data by means of a revolutionary Numericord control system recently demonstrated by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

This first commercially available system for electronic preparation of machine-control magnetic tapes directly from numerical data has resulted from three years of Giddings & Lewis sponsored research at Massachusetts Institute of Technology and allied research at the General Electric Co. With previous methods of electronic

machine control, the control media (punched tape, magnetic tape, wire, or film) had to be recorded from templates, initial operator-produced work-pieces, or "dry runs" in which the various machine components are moved through their required cycles without actually producing parts.

Now, the tapes can be prepared directly from numerical data that is precalculated from engineering drawings of the desired work-piece, tooling studies, and machine feed rates. Cams or templates are no longer required, and less skilled machine operators can be employed. The time required for non-productive operations such as tool setting, gaging, and positioning is reduced or completely eliminated. Miscalculations, human error, and possible inaccuracies in actu-

ally producing or setting up the templates on the machine are avoided.

Machining accuracy with the Numericord system is a product of engineering planning in the tape preparation stage, and is independent of the machine operator. Another outstanding advantage is that master tapes for prototype planes or other military items can be prepared in advance and stored in safe locations awaiting emergency orders for immediate production. Also, tapes can be prepared at remote locations from the production facilities, and can be quickly transferred from one plant to another if required. Part design changes and modifications can be processed on tape ready for subsequent production change-over.

With this system, machining cycles involving as many as five machine axes and twenty-two auxiliary machine functions can be completely planned and engineered by mathematical computation. Tapes are prepared at Giddings & Lewis in the room seen in Fig. 1. First, a master paper tape is prepared by entering previously calculated decimal increments of desired axes motions and time intervals on the Numericord system's sixteen-key electrical control keyboard. The operator, shown seated at the desk, transcribes such data to the keyboard in ordinary decimal digital form, and no conversion into usual binary code form is necessary. Special commands are entered on the tape in the same fashion by using six auxiliary symbols supplied on the keyboard.

An electric typewriter, seen at the operator's

left, prepares a visual checking copy of all data. Electronic tube-and-relay circuits of the paper-tape preparation unit operate automatically to verify the accuracy of all data by determining such command errors as excessive feed rates or time intervals chosen, omission of plus or minus signs in distance commands, wrong number of digits, and the improper least significant digit in any command. Other supervisory circuits in the unit examine all data fed into the unit, and perforate additional holes in the paper tape for logical control of the electronic computing director of the system. This director, with its power supply and magnetic-tape recording units, is seen in the background of Fig. 1.

"Stop" codes are placed in the paper tape sequence to provide intervals for tool examination and replacement, as well as for checking the settings of machine verniers. Thus, interruption of a machining program by tool breakage merely requires a return to the first previous "stop" signal, retooling, and then restarting of the machine-control unit. Automatic operation resumes at that stop and continues to the end of the program, unless similarly interrupted.

As an example of the system's flexibility, standard engineering type computers can be used to replace manual calculation of axes movements and time coordinates, tooling, feed, traverse, and other data necessary to program complete machining cycles. Such general-purpose computers usually require only the addition of readily available paper-tape punching units in their

Fig. 1. Numerical data in decimal digital form is transcribed on sixteen-key electrical control keyboard to make paper tape. Electronic computing director, seen in the background, records magnetic tape.



output circuits to make them usable in preparing information for the director unit of the Numeri-cord.

It is the electronic computing director which converts the decimal digital information contained on the paper tape into phase-modulated, continuous, electrical command signals for automatic recording on the proper parallel channels of a magnetic tape. In operation, the director reads the punched paper tape, line for line, storing the information thus serially presented in special magnetic-core memory units. Later commands from the director release the stored information to secondary memory units or directly to data-coordinating circuits for final impressing on the magnetic tape, as the program may require. While the director is processing one group of commands, the following groups are being read into it to assure continuous motion of the machine upon playback of the finished magnetic tape.

Most electronic components of the computing director are operated by printed circuits, mounted on removable, vertical boards which have rear plug-in contacts. More than ninety such boards are used in the complete Numeri-cord system to insure ease of inspection and maintenance. An integral, filtered-air ventilating system maintains all circuits and components at optimum operating temperature.

Visual indicators on the control panel of the director, Fig. 2, give one fine and five coarse data repeaters, which total the distance com-

mands for each machine axis as programmed at any instance during a program. The fine indicator can be connected into each of the coarse circuits by push-button, permitting the director's supervisor to check positions of all tool centers at any time, just as though he were controlling the actual machine tool directly. If any circuit is not functioning correctly, a trouble signal lamp is automatically illuminated to notify the supervisor.

Magnetic tapes thus prepared control the motion of the machine table, the cross-feed of the two heads, the height of the right-hand head (which is used for channel milling), and the swiveling of a vacuum chuck on the table. The tape control does not simply start and stop these feeds, but continuously controls their position—constantly checking feed positions against the programmed motions recorded on the tape. Other functions that would normally be initiated by push-buttons or limit switches are also performed automatically.

Parallel channels on the tape permit simultaneous machine axes movements, together with auxiliary-function control. For example, when a 400-cycle signal appears on a particular auxiliary-function channel, the drive is transferred from the right- to the left-hand head of the machine. When this signal disappears, the drive reverts to the right-hand head. Appearance of a 200-cycle signal on another channel starts the coolant flow, while on still other channels such signals automatically control oil-pumps, chip

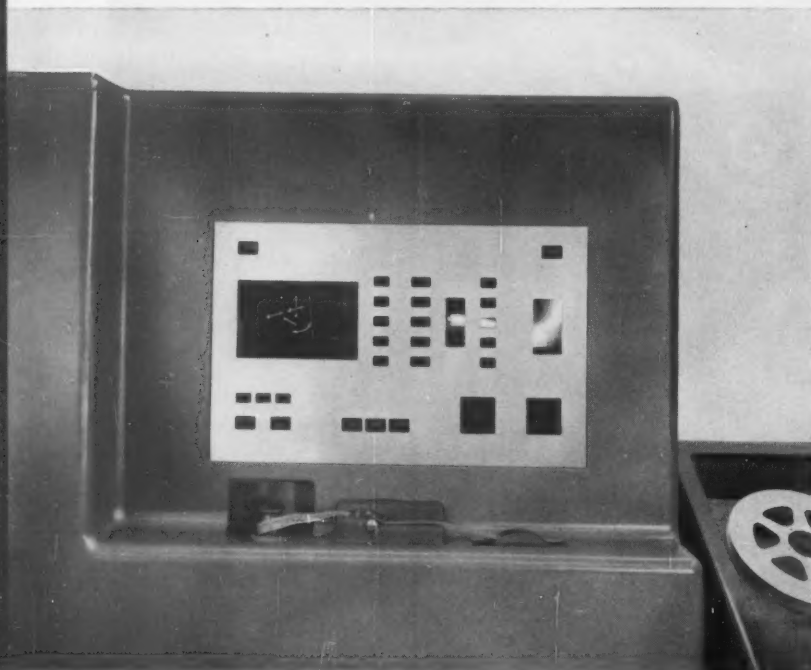


Fig. 2. Close-up view of paper-tape reading mechanism and control panel of computing director unit (Fig. 1). Visual indicators on control panel show supervisor the total distance commands for each machine axis.

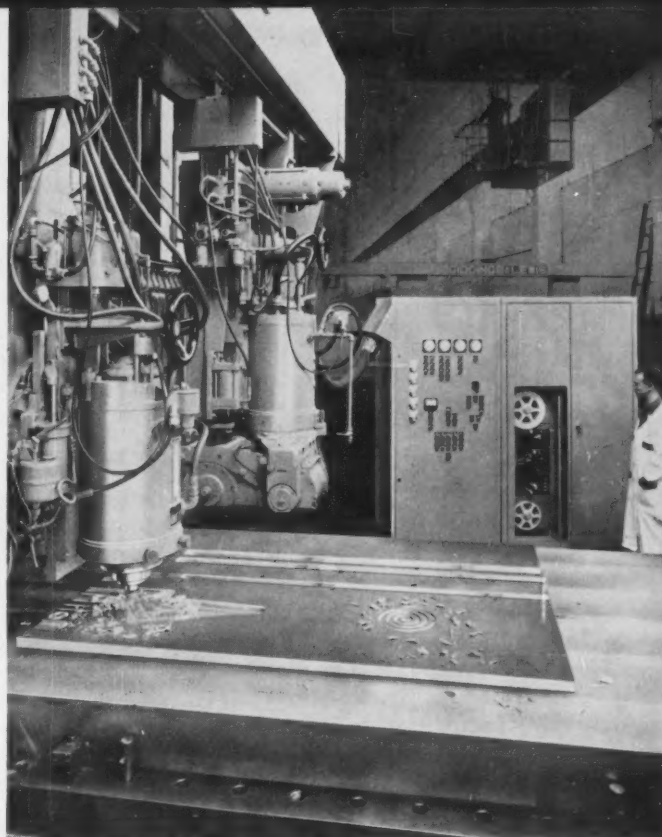
Fig. 3. Versatility of magnetic-tape controlled skin-mill is shown by various plunge, channel, pocket, and contour cuts made in aluminum-alloy plate. An Archimedean spiral cut is seen in the right foreground.

conveyors, or provide planned "stops" for both machine and tape.

An electronic playback unit connected to the machine reads all fourteen parallel channels on the magnetic tape simultaneously. The unit sends a constant stream of signals to the machine controlling all its movements and functions in accordance with the requirements of the machining program. On the skin-milling machine used in the Giddings & Lewis demonstration, the three axes of the machine were under numerical tape control, plus such basic functions as start, stop, traverse, and similar machine auxiliary functions and non-feed controls.

Control of each machine axis is accomplished by a direct-current drive motor connected through anti-friction bearing nut-and-screw mechanisms. Each axis has an independent, closed-loop feed-back servo circuit, with parallel-mounted, precision rack and pinion gearing which accurately translates feed movement into rotation of the rotor shaft of the synchro. A movement of but 0.100 inch in a machine axis produces one complete revolution of its synchro rotor. Both drive and feed-back assure minimum backlash and friction-free operation for maximum accuracy in positioning the tool-heads and improving the finish produced on the machined parts. The amplidyne-generator powered servo-mechanisms, which perform all traverse and feed functions automatically, have a wide range and are responsive to minute current changes obtained by electronically reading the magnetic tape. The entire machining program is repeated constantly and accurately to produce identical parts in any quantity desired. Tolerances maintained are limited only by the machine tool, and ordinarily are well within aircraft part requirements.

While applicable to virtually any machine tool, the new Numericord system was demonstrated at Giddings & Lewis for controlling one of their aircraft spar- and skin-milling machines. This machine, seen in the heading illustration, has an over-all width of 20 feet 9 inches, a height of 15 feet 3 inches, and a length of 40 feet. Clearance under the rail is 48 inches, and the table work area is 72 inches wide by 14 feet long. The machine is equipped with one 360-degree profiling, left-hand head powered by a 50-H.P. motor, and one rise-and-fall right-hand head powered by a 100-H.P. motor. Normal head speeds are 3600 R.P.M., and the maximum metal removal rate is 450 cubic inches per minute. To



remove the large amount of chips produced, the machine is equipped with an automatic vacuum removal system.

In the demonstration, the machine performed various plunge, channel, pocket, and contour cuts necessary to mill complete jet plane skin and wing panels from solid 75S-T aluminum-alloy plates. Estimates indicated that for aircraft configuration work, similar to the integrally stiffened horizontal stabilizer skin for the new North American F-100 Super Sabre, the Numericord system can effect substantial savings in machining time over present manually operated methods. Such savings accrue from the system's simultaneous control of multiple feeds, and virtual elimination of non-cutting intervals that insures practically 100 per cent machine productivity on even the most complex work-pieces.

Extreme flexibility of the Numericord system was demonstrated by the number of ways in which it can be used. In addition to operating on numerically prepared tapes, the machine-control portion of the system can be used independently to produce its own tapes by several methods. In one such method, machining cycles are recorded under template control. Signals are impressed on the magnetic tape by machine-axes synchros as they report tool-head travel. When an entire program has been recorded from a template, succeeding parts can be produced by playing back the tape thus produced. Recorded tapes can be similarly produced by having the

operator put the machine through simulated machining motions in a "dry run." Again synchros, attached to feed drives, record the entire program on magnetic tape just as the machine simulates it—yet with non-cutting intervals of more than twenty seconds eliminated to assure virtually continuous machining on playback of the tape. This method can also be used when the operator actually machines an initial part; the tape recording is then available to produce any number of succeeding duplicate parts automatically.

As a climax to the demonstration, the inherent versatility of the system was also shown by automatically machining an Archimedean spiral, for which the coordinate data was prepared on the company's I.B.M. computing equipment. The spiral, having four turns, is seen in the right foreground of the aluminum work-piece illustrated in Fig. 3.

In addition to its spar- and skin-milling machine, other machines which Giddings & Lewis is offering with Numericord control include horizontal boring, drilling and milling machines; planer type milling machines, and vertical boring mills. However, since the Numericord system can control up to five machine axes simultaneously, it finds its most effective application on variable-axis, three-dimensional contouring machines such as those recently introduced by

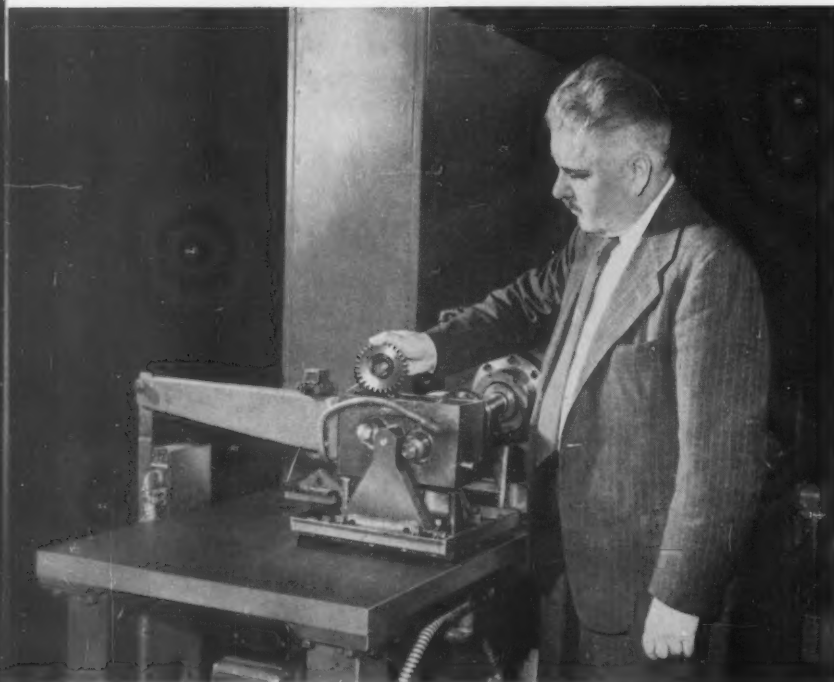
Giddings & Lewis for milling complex aircraft configurations.

An important advantage of the system is that standard, commercially available components having established records of reliability are used. A novel feature is the ease with which audio signals can be included on the magnetic tape. Such signals could be used to alert the machine attendant for required tool changes or pre-set inspection periods. Such audible commands, synchronized with machine control cycles, add materially to the versatility of this type of automatic machining.

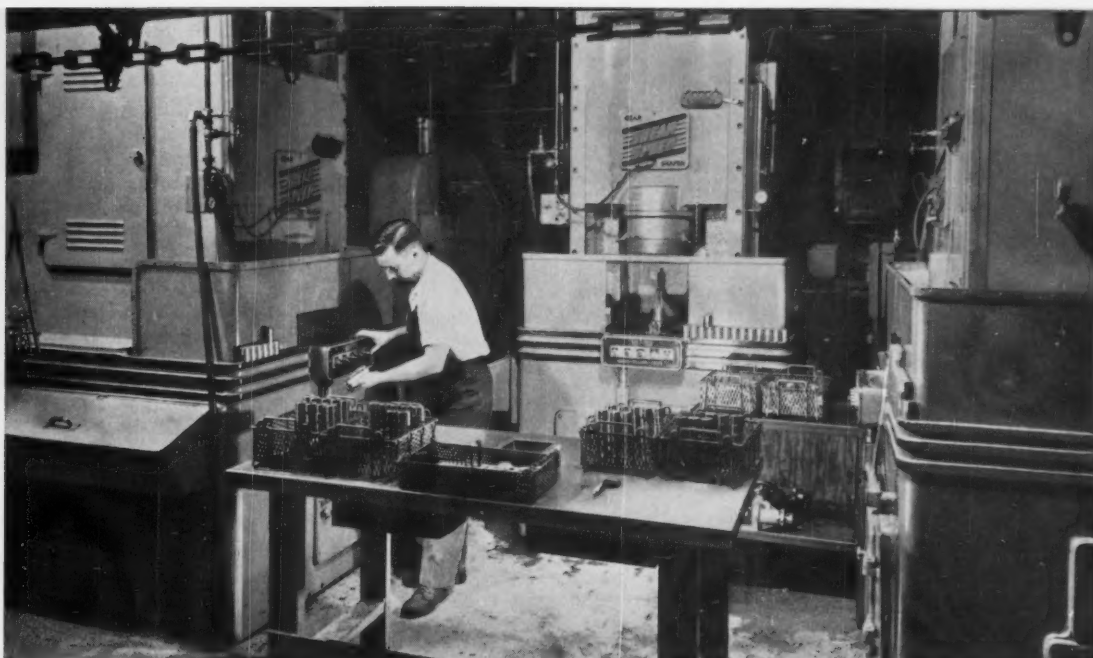
* * *

Italian Machine Tools at Chicago Coliseum

Through the agency of the Maserati Corporation of America, Westbury, N. Y., members of the Italian machine tool industry will exhibit at the Machinery and Equipment Exposition in the Chicago Coliseum, September 6 to 17. On display will be horizontal and vertical milling machines, hydraulic surface grinders, radial drilling machines, hydraulic tracing attachments for lathes, milling machines, shapers, engine lathes, vertical boring machines, tool-room lathes, and iron workers. Maserati, Caser, Induma, Moranda, and Diplomatic machines will be included.



Automotive type test gears are mounted in a gear-box and run under load at the International Nickel Co.'s Research Laboratory, Bayonne, N. J. Complete records are kept of operating temperatures and noise levels of the running gears. Steady increases in the noise readings are indicative of impending gear failure.



Cast-Iron and Steel Gears Cut Simultaneously

OIL-PUMPS for Chevrolet's new Turbo-Fire V-8 engine are equipped with a steel driving gear and a cast-iron driven gear to prevent galling. All the teeth in two gears—one steel and one cast iron—are cut simultaneously in a high-production set-up at the Van Slyke Road Engine Plant, Chevrolet Motor Division, General Motors Corporation, Flint, Mich.

Gear cutting is performed on Michigan Tool

Shear-Speed gear shapers. Three machines are employed which are arranged in a compact U-shaped lay-out as seen in the heading illustration. One operator can take care of loading and unloading all three of the automatic cycling machines.

Close tolerances are maintained and smooth surface finishes are produced to insure excellent mating and rolling action of the gear teeth. The

Fig. 1. Oil-pump driving gear (left) is cut from a steel blank at same time that cast-iron driven gear is shaped on the machine seen in Fig. 2.



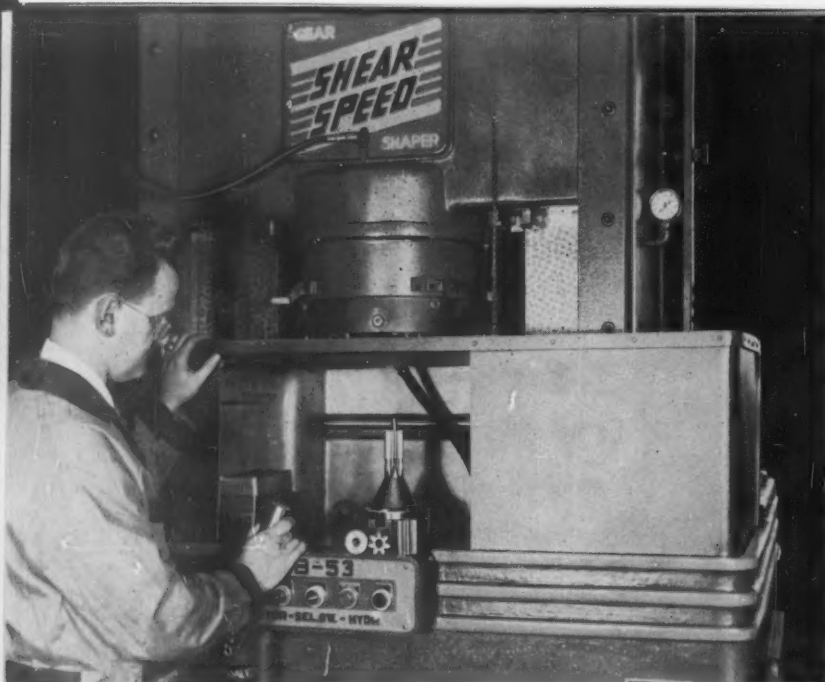


Fig. 2. Two gear blanks are pneumatically clamped and reciprocated vertically while being shaped by a set of seven cutter blades which are fed radially inward.

oil-pump gears have seven teeth of 6 diametral pitch, 28-degree pressure angle, and 0.5235 circular pitch. Whole depth of the teeth is 0.3595 inch, the corrected addendum is 0.181 inch, and chordal thickness of each tooth is 0.259 inch. Backlash is maintained between 0.009 and 0.015 inch, and eccentricity of the pitch diameter with relation to the gear bore must not exceed 0.004-inch total indicator reading.

Fillets at the roots of the teeth are perfectly formed to a radius of only 0.080 inch, with no scallops or ridges. Also, because a cast-iron blank

is mounted below the steel blank for machining, there are no burrs produced on the steel gear face in cutting the teeth. A completed cast-iron gear is shown at the right and a steel gear at the left in Fig. 1.

The gear blanks are turned, faced, drilled, bored, reamed, chamfered, and cut off on Conomatic six-spindle machines. Then a cast-iron and a steel blank are manually placed on a vertical reciprocating arbor and pneumatically clamped in position on the Shear-Speed shaper, as seen in Fig. 2. A set of seven formed cutter blades are assembled radially in a cutter fixture, Fig. 3, which is mounted in the head of each Shear-Speed machine. During the automatic cutting cycle, the blades are fed inward a pre-set amount before each upward stroke of the gears. The blades are automatically retracted for the return stroke of the work-pieces. This avoids drag across the tooth surfaces. Each blade removes the amount of metal required to form the space between two adjoining teeth.

Radial inward feed of the cutter blades is cam-controlled with the cam designed to feed the blades in progressively smaller increments as the tooth spaces approach full depth. Average infeed of the blades is 0.006 inch per stroke. Each set of blades is re-sharpened after cutting about 700 gears. Only the top face of each blade has to be ground when sharpening becomes necessary. Thus, the required tooth form is always maintained, and sharpening of the blades can be performed quickly and easily.

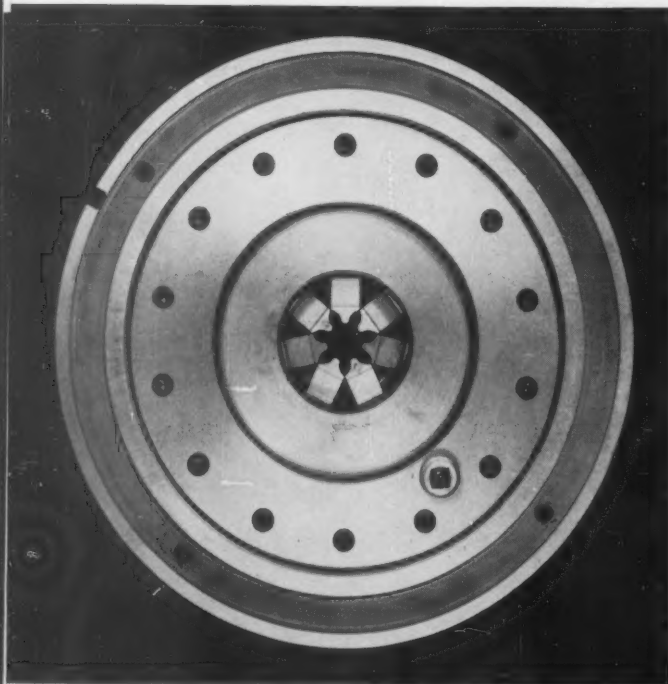


Fig. 3. Seven formed cutter blades, assembled radially in a cutter fixture on machine seen in Fig. 2, are fed inward to form spaces between adjoining teeth of gears.

Electro-Mechanical Integration to be Featured at Machine Tool Show

By JOHN E. WALKER
Reliance Electric & Engineering Co.
Cleveland, Ohio

ACTUAL operation of more than one thousand machine tools of advanced design will draw the attention of visitors to the 1955 Machine Tool Show at Chicago's International Amphitheatre, September 6 through 17. In striking contrast to the previous show, held in 1947, an average of 50 per cent greater horsepower is being applied to the machines. A total of 15,000 H.P. will be required to drive the vast array of equipment on exhibit.

Many machine tools will contain the latest electrical drives and controls to provide higher speeds, greater power, shorter cycles, and an increased degree of automatic operation. In addition, there will be evidence of the trend toward greater operator convenience, more machine flexibility, and lessened mechanical and electrical maintenance.

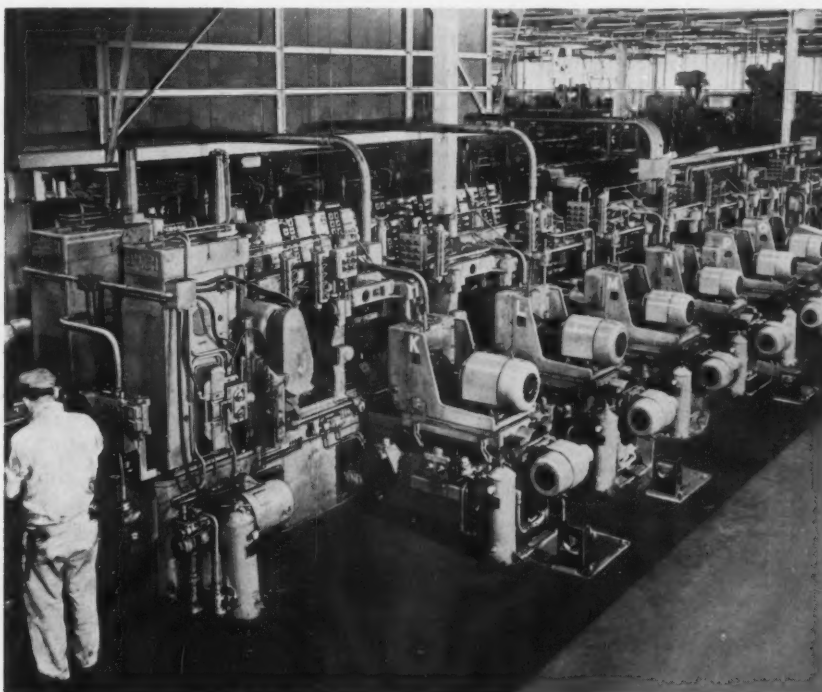
Alternating-current motors conforming to new NEMA ratings will make their initial show appearance. These motors meet the need for

smaller physical size, with the same or even greater horsepower. Many of them are integral parts of the machine. In Fig. 1, for example, is an automated line in an automobile engine plant. Banks of alternating-current motors power the individual machining stations.

Other features that will be found in the show machines include advanced variable-speed rotating and electronic drives, stepless speed controls, smooth and precise jogging controls, and programming mechanisms. Some of the electronic "brains" seen operating will be contour controls for one-, two-, and three-motion machining. Also to be shown are constant cutting-speed controls, and fully automatic controls for machining by magnetic or punched tape, punched card, or other play-back systems.

The concept of machine tool design has changed significantly in the last ten years. It is no longer possible to build a competitive machine by considering only mechanical features in

Fig. 1. Banks of alternating-current motors built to the new NEMA ratings power this transfer type production line.



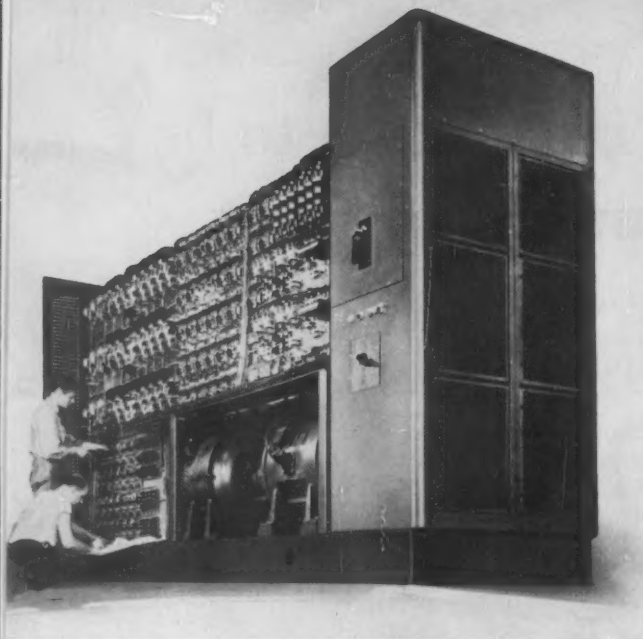


Fig. 2. Grouped in this cabinet are the electrical controls for the twenty-four motors which deliver 300 H.P. to a single milling machine.

the basic design approach, and then add the motor later. How closely integrated electro-mechanical design must be is illustrated by a modern triple-head rail type milling machine. A total of twenty-four motors, supplying 300 H.P., control and drive this machine—three 50-H.P. adjustable-speed direct-current spindle motors, three 15- to 50-H.P. traverse motors, three 5- to 15-H.P. adjustable-speed direct-current feed motors, twelve clamp and quill-adjusting motors, and three lubricating and hydraulic pump motors. The control cabinet for the equipment is shown in Fig. 2.

A significant innovation is an electric motor and control system known as a forced-torque drive. Its action consists of forcing a generator

to apply instantaneously up to eight times the normal field voltage, thus reducing the time required to reach a particular point in the machining cycle. The electrical system is designed to control the voltage across the motor, to obtain maximum acceleration and still avoid electrical damage or undesirable mechanical shock. Each part of the cycle can be performed at optimum speed, so that an over-all time reduction is obtained, proportional to the amount of forcing that has been effected.

An example of a forced-torque drive application is the 500-H.P. drive powering a triple-action press which forms automobile body sections. Performance over a period of three years has established an excellent production record, with little down time for repairs. Raising speed during non-working portions of the cycle has shortened total cycle time. Improved speed control during the working portion of the cycle has produced a 50 per cent reduction in scrap loss, saving from 5 to 10 per cent of the total production time.

This forced-torque drive is applied directly to the crank-arm of the press. In this manner, the use of gears, clutches, and flywheels is eliminated, to further simplify the press design and reduce the maintenance required. A feeder, also equipped with a forced-torque drive, supplies this press with sheet steel. Subsequent forming and welding operations utilize the same drive. One of the installations of the drive is illustrated in Fig. 3.

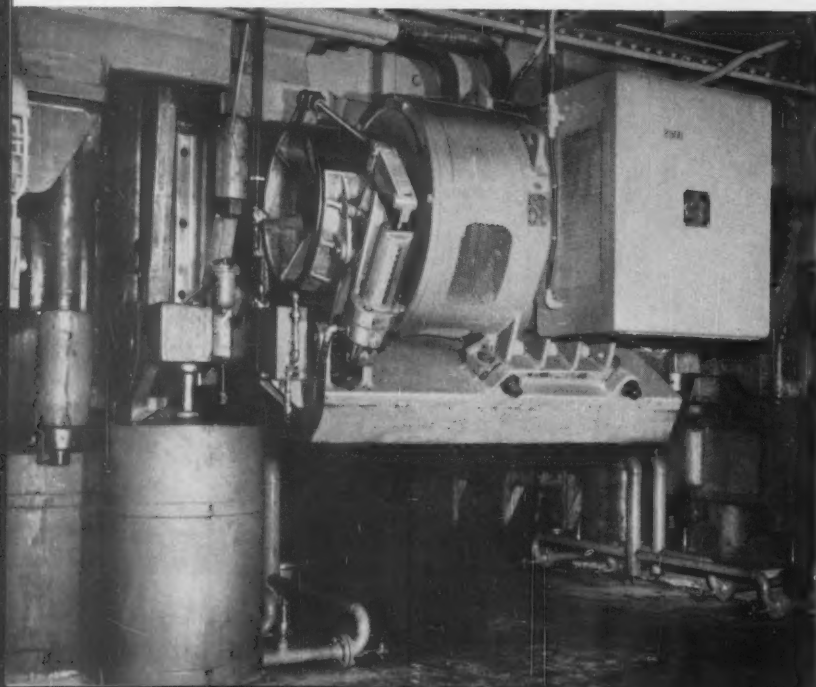
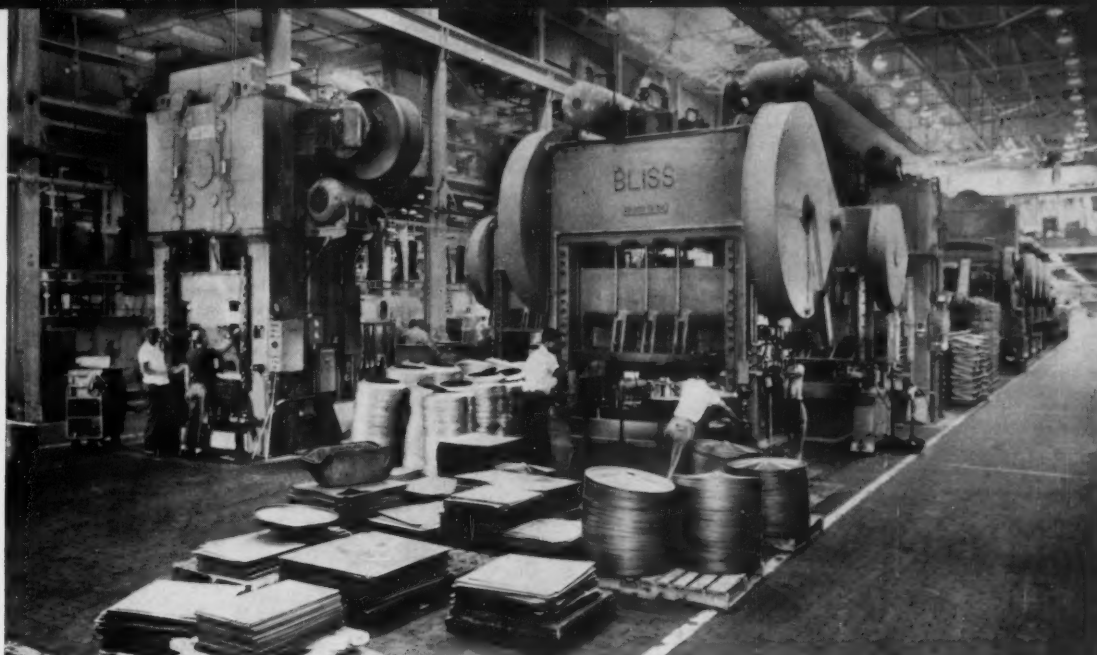


Fig. 3. A view of a forced-torque 500-H.P. drive applied directly to the crank-arm of a press.



Modern Machines Produce Modern Appliances

Unusual forming, expanding, welding, and piercing operations are performed on the latest type production equipment in manufacturing the new Westinghouse combination washer-dryer

By WILLIAM A. RUSH, Manufacturing Engineer
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Westinghouse Electric Corporation
Columbus, Ohio

THE Wash'N Dry Laundromat, a new Westinghouse appliance that automatically washes clothes and then dries them, is being produced at the rate of one every three minutes in the Columbus, Ohio, plant of the Electric Appliance Division. This modern factory has been provided with the latest type manufacturing equipment so that production can be boosted to 400 Laundromats per eight-hour shift without the need for expanding facilities.

Exact design and manufacturing specifications for this unique household appliance are met by maintaining a rigid quality control program. For example, all incoming steel is inspected, before it is used, for alloy content, size, tensile strength, hardness, and surface conditions. During subsequent shearing, forming, welding, and other production operations, periodic inspections are made for size, depth of emboss, width and squareness of flanges, and

size and location of various holes. Also, surfaces of the various parts are examined to insure that no die marks, burrs, or scratches have been made.

Manufacture of the Wash'N Dry Laundromat begins in the large steel storage area. Steel sheets that have been approved for production by Quality Control are automatically washed, heated, sprayed with drawing compound, and dried in a special machine. The coated sheets, varying from 0.032 to 0.093 inch in thickness, are then sheared to any one of the hundreds of sizes needed to make a washer-dryer.

Blanking, piercing, forming, notching, and trimming of the correctly sized sheets are performed on various presses in the plant area seen in the heading illustration. The number of press operations required for different parts varies up to an eleven-die processing for the complex washer-dryer top.



Fig. 1. Two dies are mounted on this 400-ton press for preforming and finish-forming the top panels used on combination washer-dryer.

In several instances, multiple-die operations are performed on a single press. For example, the top panel is preformed and finish-formed in two dies mounted on the four-point suspension, 400-ton press seen in Fig. 1. This press has a bolster 108 inches long by 76 inches wide, an 18-inch stroke, and a delayed-action air cushion. One operator, on the opposite side of the press, loads sheets into the die seen at the left. Another operator removes the preformed top panel from this die and passes it to the operator seen at the right for inserting in the finish-forming die.

The outer tub body for the automatic washer-dryer is made from a vitreous enameling grade of sheet steel. The sheet stock is accurately sheared to a length of approximately 84 $\frac{3}{4}$ inches by 13 $\frac{1}{2}$ inches wide. A vent-hole and locating notch are blanked in the sheet in a press operation. This notch is used for locating purpose in all subsequent operations.

The outer tub body sheet is fed into a pyramid roll-forming machine which shapes it into a cylinder having a diameter slightly smaller than the required finished size. Formed cylinders slide down a gravity conveyor to the roller type resistance welding machine shown in Fig. 2. This machine is equipped for hydraulic clamping of the work-piece, and has a water-cooled electrode wheel. When the cylindrical tub is placed on the machine mandrel, the ends of the formed sheet are overlapped to make a seam. After clamping the work-piece, the lap seam is automatically roller-welded and mashed to provide practically single metal thickness in the welded seam area. This operation is critical because the strength of the part is important, and the tub body must be water-tight.

A special cleaning fixture is employed to simultaneously wire-brush both inner and outer surfaces of the seam weld. The tub body is then placed on an expanding machine, Fig. 3, which stretches the metal to increase the body diameter approximately $\frac{1}{4}$ inch. This operation sets the metal so that it will maintain its cylindrical shape, and produces the required 27-inch diameter. Simultaneously, a flange $\frac{9}{16}$ inch wide



Fig. 2. Outer tub body, previously rolled into a cylinder from a flat sheet, is seam roller-welded and mashed to single metal thickness in this automatic operation.

and flared at an angle of 10 degrees is formed on the bottom of the body for subsequent assembly of the tub back. Expansion and flanging are performed by cam-actuated, radially acting dies.

Additional operations performed on the outer tub body include blanking of a sump hole on a horn press, circular mash-seam welding of a cap to the body front, and tack-welding a condenser chamber in place. This condenser chamber is the device which eliminates the necessity for venting the Wash'N Dry Laundromat. All mounting and hanging brackets are resistance-welded to the tub body by means of portable spot-welding guns. For additional strength, the brackets are then arc-welded to the body. Arc welding is also used to seal the bottom seam of the condenser. After welding a clothes chute to the outer tub cap, the tub is stored or delivered by chain conveyor to the porcelain enamel section.

The spinner basket also starts out as a flat sheet of vitreous enameling grade steel which has three sets of eight ribs formed into it in the press area. A special hydraulic press is used to form three equally spaced vanes in the sheet. This formed sheet is rolled into a cylinder on another special machine, Fig. 4. One end of the sheet is hydraulically clamped between two rolls having formed vanes on their peripheries. As the rolls rotate, the sheet is formed into the desired cylinder. The ends of the cylinder are first tack-welded and then seam resistance-welded together.

A second expanding machine, Fig. 5, is used to increase the spinner basket diameter about 1/4 inch, to the required 25.500 inch diameter. The hydraulic cylinder seen on the side of the machine is used to insert three dies into the previously formed vanes so that stretching does not occur in these areas.

The specially designed machine seen in Fig. 6 is used to pierce and emboss 1593 holes, 7/32 inch in diameter, in the spinner basket. Less than a minute is required to finish the completely automatic cycle for each basket. The holes, which drain off water during the spin cycle and provide uniform distribution of heated air during the drying cycle of the Laundromat, are embossed outward to a height of 1/16 inch above the basket periphery.

When a basket has been placed on the machine and hydraulically clamped, 177 holes are pierced and embossed in a single stroke of the radially acting punches and dies, 59 holes being made in each of three sections on the basket. Then, the



Fig. 3. Diameter of outer tub body is increased about 1/4 inch by stretching the metal on this expanding machine. Simultaneously, a flange is formed on the body.



Fig. 4. On this special machine, preformed flat sheets are rolled into cylindrical spinner baskets by hydraulically clamping and rotating between two rolls.

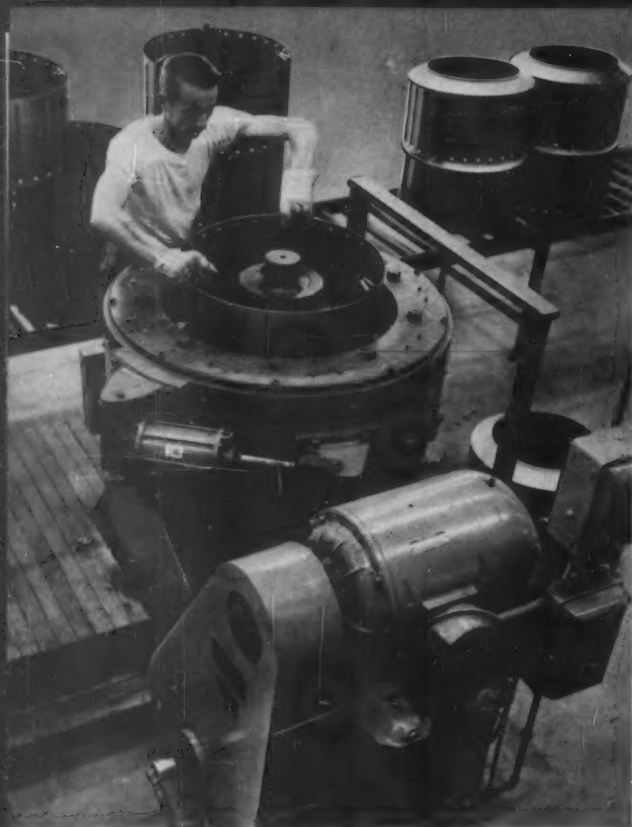


Fig. 5. Mechanical expanding machine for increasing outside diameter of spinner basket to 25.500 inches. Dies enter vanes to prevent stretching in these areas.

basket is automatically indexed nine times, with 177 more holes being pierced and embossed after each indexing. After removing a completed basket from the machine, and replacing it with an unpierced one, the cycle is repeated with the work-piece indexing in the opposite direction.

The holes in the basket must be uniformly spaced between the previously formed ribs and vanes. Accurate indexing is obtained by a hydraulically operated Geneva motion controlled by solenoids. The heights of the punches are stag-

gered so that about one-third of the holes per stroke are pierced at a time, thus reducing the pressure required. Even so, a pressure of 45 tons is required. Punches are actuated by a hydraulic cylinder and rocker arms, and positive knock-outs are provided. The use of quick-change mounting units permits the punches to be replaced in about one-half hour. Set-screws are provided behind the punches for height adjustment.

Another of the many welding operations performed in fabricating the various washer-dryer parts is illustrated in Fig. 7. Here a hub washer sub-assembly that has been arc-welded to the tub back is placed in a fixture where a diaphragm has been accurately located, and the two parts are joined by submerged arc welding.

After fabrication and inspection of the outer tub, basket, and heater and blower housing, these three assemblies are sent through an automatic pickling machine where they are thoroughly cleaned to assure good enamel adhesion. This cleaning process removes any scale, rust, oil, or drawing compounds used in the press area, it then etches the surface, and finally applies a thin coat of nickel. After the parts are properly prepared they are dipped and thoroughly coated with a special porcelain enamel. After dipping, the basket is spun on a fixture to remove excess enamel from the many small drain holes and to assure proper thickness of coating. The parts are then dried at 225 degrees F., and fired at 1540 degrees F. After again inspecting, these parts are sent by means of an overhead conveyor to the assembly line.



Fig. 6. A total of 1593 holes, 7/32 inch in diameter, are pierced and embossed in the spinner basket on this specially designed hydraulically operated machine.

Fig. 7. Submerged arc welding is employed to join the hub washer and tub back sub-assembly to a diaphragm. Space between tub back and diaphragm must be air-tight.

In the painted parts fabrication area, all sub-assemblies are resistance-welded together prior to finishing. From this area the parts go through a machine which automatically washes, rinses, rust proofs, and etches all surfaces so the subsequent finish will have better adhesion. The parts then go to a device which flow coats them with a synthetic epoxy-resin finish. The parts then travel through a drain area and finally through an oven for drying. Parts which are used on the outer body of the Wash'N Dry Laundromat are next given a prime coat of paint, baked, hand-sanded and rubbed, spray-coated with a finish coat of white enamel, and finally baked. The finished parts are inspected and then started on their way to the final assembly line by overhead conveyor.

Final assembly begins with the arrival of all the component parts at their proper points in the assembly area. First the valve which keeps the water in during the wash cycle and allows air to enter during the dry cycle, is assembled to the outer tub body. Then other parts are added. Along a short section of roller conveyor the rubber boot is fastened in place, the blower and heater assembly are added, a condenser top is attached, and the connector tube is positioned to close the air circuit through the machine.

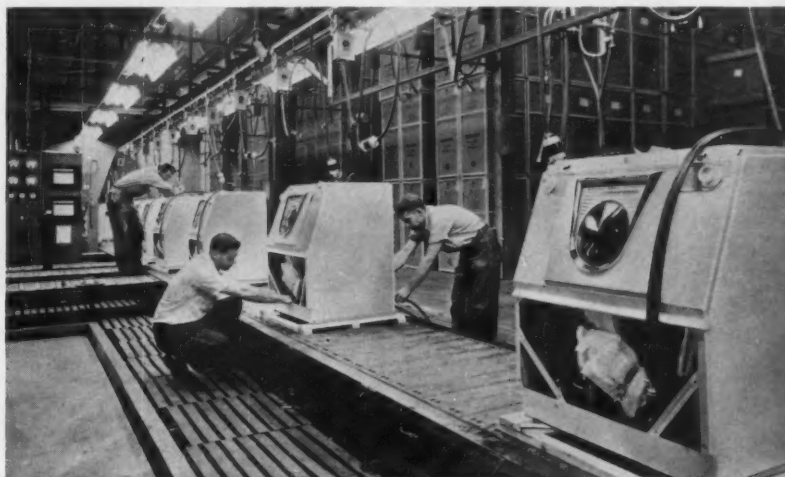
From the roller conveyor the tub assembly is hung on an overhead assembly conveyor, where the complete drive unit—pulley, belt, bump switch plate, and drain hose—are added. Next the overhead conveyor enters the inspection area where a travelogue ticket is placed on the tub assembly. This ticket will stay with the tub until it is shipped as part of a completed machine. Quality control in this area starts by filling the unit with water, then running it to check for leaks.

After visual and electrical checks, about eight



gallons of water are dumped into the machine. The fill hoses are connected to a controlled water source and the final fill level checked. While the machine is running, leak checks are made. Then the pump is checked for operation. The machine next enters a sound tunnel where an inspector puts a volley ball filled with eight pounds of water into the machine to simulate a load of wet clothes. The timers then will be advanced through their entire range while the inspector listens for unwanted noises and checks proper operation of all parts. Off to the side of this conveyor is a station where finished machines are run through their complete cycle (using canvas as the load) to check the machine under actual running conditions. Satisfactory machines are given further tests, Fig. 8, crated, and moved to the warehouse for shipment.

Fig. 8. A final check of mechanical and electrical parts is given before attaching the service panel. Satisfactory machines are crated and moved to the warehouse for shipment.



American Gear Manufacturers Convene at Hot Springs

HOT SPRINGS, VA., was host to the American Gear Manufacturers Association convening for its thirty-ninth annual meeting, which took place at the Homestead from June 5 to 8, inclusive. During this meeting Marvin R. Anderson, executive vice-president of the Michigan Tool Co., Detroit, Mich., was elected president; Fred R. Eberhardt, president of the Eberhardt-Denver Co., Denver, Colo., was elected vice-president; and Gunnar E. Gunderson, president of the Brad Foote Gear Works, Inc., Cicero, Ill., was elected treasurer.

For several years Mr. Anderson has been active in AGMA, having served a three-year term on the Executive Committee and, for the past year, was vice-president. Mr. Eberhardt's past activities within the Association include service on several of the engineering committees and terms of office as a member of the Executive Committee as well as being treasurer. Several years of AGMA activity are behind Mr. Gunderson. During this time he has served a three-year term as a member of the Executive Committee.

A three-year term, starting in June, 1955, will be served by the following newly elected members of the Executive Committee: Walter W. Trout, president of the Lufkin Foundry & Machine Co., Lufkin, Tex.; R. W. Johnson, director of sales for the Foote Bros. Gear & Machine Corporation, Chicago, Ill.; John L. Buehler, presi-

dent of the Indiana Gear Works, Inc., Indianapolis, Ind.; and D. W. Diefendorf, president of the Diefendorf Gear Corporation, Syracuse, N. Y.

Several outstanding papers were presented before the Association members. One of these, entitled "Spiroid Gears," was presented by Fred Bohle and Oliver Saari, Illinois Tool Works, Chicago, Ill. Said Mr. Bohle, "Spiroid gears are a new addition to the family of skew-axis gears. They provide gear designers with a new and very practical area for the position of their gear axes." A dissertation of interest, "Gearing Gobbledygook," was presented by L. D. Martin, gear consultant. A condensation of this talk appears on page 168 of this number of MACHINERY.

Also presented was a special paper by Walter P. Schmitter, vice-president and chief engineer of the Falk Corporation, Milwaukee, Wis., dealing with surface durability rating standards of the AGMA for spur, helical, and herringbone gearing. This paper was prepared in response to numerous requests for a recapitulation of the development of the Association's standard rating for these gears. Engineers employing these standard rating procedures can do so with greater confidence when they have an understanding of the manner in which the basic factors have been brought together in the rating charts. Much of the information presented in this paper was contained in reports that have long since been out of print.



(Left to right) Marvin R. Anderson, newly elected president of the American Gear Manufacturers Association; Fred R. Eberhardt, vice-president; and Gunnar E. Gunderson, treasurer

INGENIOUS

Mechanisms

Mechanisms selected by experienced machine designers as typical examples applicable in the construction of automatic machines and other devices

Fool-Proof Indexing Mechanism

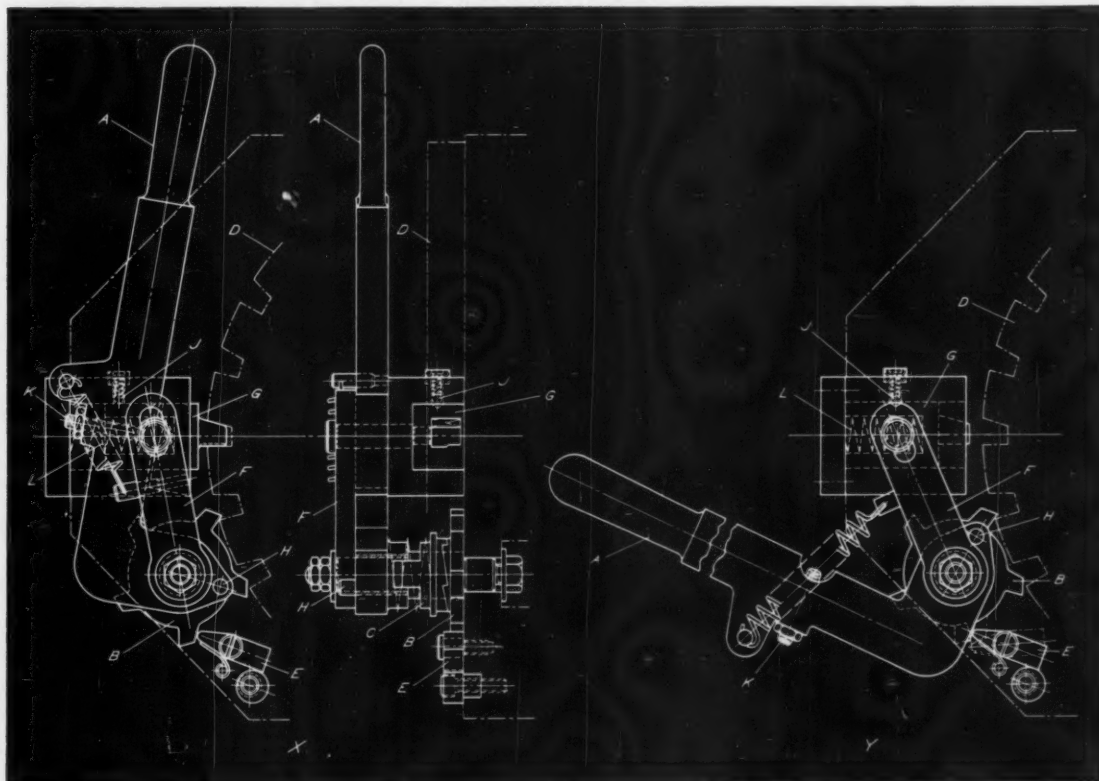
By THOMAS R. GOULDEN, Lanarkshire, Scotland

Necessity for the design of an indexing mechanism that will not overshoot the desired position or otherwise inaccurately index, is often encountered in tool design departments. This is especially true when a weighty fixture is to be carried by a large index-table. A lever type indexing mechanism that is fool-proof in operation is shown in the accompanying illustration.

Lever *A* pivots about a spindle that is also common to both ratchet wheel *B* and spring-loaded dog *C*. The dog remains engaged in a slot milled across a boss integral with the lever. The ratchet-wheel teeth are cut to mesh with mating

spaces in the periphery of index-plate *D*. Pawl *E*, resting against a flat spring, restricts the motion of the ratchet wheel to a clockwise direction only. The back end of the pawl rests against an adjustable cam-stop.

At one end, slotted lever *F* pivots freely on the common spindle, while at the opposite end it is connected to locating plunger *G* by a headed pin. The locating plunger slides in a guide block fastened to the base of the indexing table. A locating tongue on the plunger end is accurately ground to fit within the tooth spaces around index-plate *D*. This tongue is partially relieved on the face parallel to the horizontal center line to clear any burrs that may have been raised in the tooth spaces on index-plate *D* by the action of ratchet wheel *B*.



Index-plate mechanism incorporates locating device and one-directional driving dog to provide fool-proof operation by eliminating the possibility of faulty indexing.

To move the index-plate from one position to the next, lever *A* is moved from the position shown at *X* to that shown at *Y*. During the initial part of this motion, pin *H*, a press fit in the short leg of the lever, moves freely in an arc until it contacts slotted lever *F*. The pin, during the remainder of the stroke, forces the slotted lever to pivot around the common spindle, thereby disengaging locating plunger *G* from the index-plate. At the end of the stroke, spring-loaded ball *J* rides into a cone-shaped recess in the top plunger face. The plunger is thus held in the retracted position.

At the same time that these movements are taking place, spring-loaded dog *C* freewheels over the dog teeth that are integral with ratchet wheel *B* and drops into position after having moved a distance equal to one dog tooth. The ratchet wheel, which has the same number of dog teeth as ratchet teeth, is prevented from turning by pawl *E*.

Lever *A* is now moved back to its original position. In doing so, dog *C* drives ratchet wheel *B* one tooth which, in turn, moves the index-plate to the next position. During the first part of this stroke, spring-loaded ball *J* retains locating plunger *G*, allowing the index-plate to move unrestricted. Toward the end of the stroke an adjustable screw *K*, which is threaded through a pad on the lever, contacts the pin connecting slotted lever *F* with the plunger. This drives the plunger forward causing the locating tongue to enter a tooth slot on the index-plate, thus locking it firmly in place. The plunger is held in this position by coil spring *L*.

Two Opposed Slides Driven with Rapid Variable Strokes

WILLIAM H. MORSON, Birkdale, England

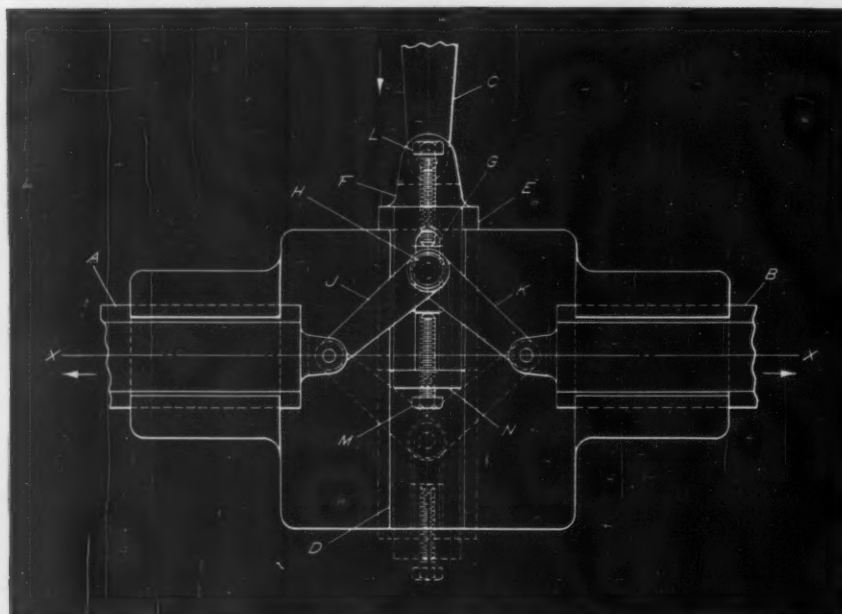
One phase of the operation of a particular wrapping machine involves the transfer of cartons across a stationary table. Each carton is gripped on two opposite sides by a pair of slides. The accompanying illustration shows a simple lever type driving mechanism designed to actuate the two slides with a synchronous movement in opposite directions.

Slides *A* and *B* may move freely within their respective dovetailed guide ways which are provided across the top of a cast-iron baseplate. This baseplate is bolted to the frame of the machine in line with driving arm *C* which is a source of reciprocating motion.

Across the center portion of the baseplate is machined a third dovetailed guide way *D* situated at right angles to the first two. Riding within it is slide *E*. Lug *F*, which is integral with the third slide, is slotted to receive the end of the driving arm.

Machined along the top of slide *E* is a narrow T-shaped slot into which is fitted a steel sliding block *G*. This member is drilled to receive shoulder stud *H*. Mounted on the projecting portion of this stud are the ends of two identical levers *J* and *K*. The opposite ends of these two levers are connected to slides *A* and *B* respectively, as shown.

The sliding block *G* is locked in position by means of clamp screws *L* and *M*. Screw *L* is



An adjustable mechanism which drives two opposed slides from a single reciprocating rod

threaded through the rear end wall of slide *E*, while screw *M* passes through a small plate *N*. This plate is secured to the front face of the slide. When the lever mechanism is set for normal working conditions, the clamp screws are locked tightly against member *G*.

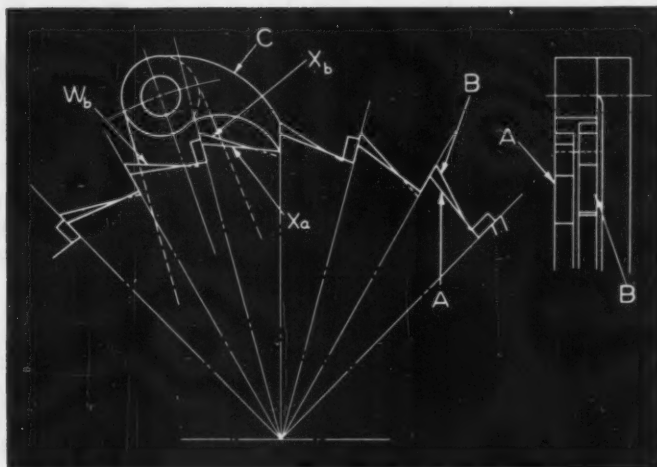
Operation of this mechanism and the manner of its adjustment will be clearly understood by referring to the illustration. The solid lines show the driven slides in their innermost position which occurs when slide *E* is fully retracted. To obtain the most efficient operation of the mechanism, the angle subtended by levers *J* and *K* in this position must never be less than 90 degrees. In practice it will be advisable to limit the terminal positions of these levers to a minimum included angle of 100 degrees.

As driving arm *C* moves forward forcing slide *E* ahead of it, levers *J* and *K* will straighten out. This action will force the driven slides apart equally. The maximum forward stroke imparted to these driven members will occur when the center of shoulder stud *H* lies on axis *X-X* along which the slides travel.

Further travel of slide *E* beyond axis *X-X* will cause the driven slides to retract in unison until they reach their innermost positions as shown by the light broken lines. A return stroke of the driving arm will produce a duplication of these movements.

Alterations in stroke length of the driven slides are obtained by adjusting the throw of the crankpin on the driving shaft (not shown). Variations in the working positions of the driven slides are obtained by adjusting the position of sliding block *G*. To facilitate setting of this block, the top surface of slide *E* may be graduated and the baseplate marked with a zero line.

Dwell periods may be procured at each terminal point in the movements of slides *A* and *B* if desired. By allowing block *G* to have a certain amount of independent sliding movement within slot in slide *E*, a corresponding motion will be subtracted from the stroke of the driven slides, thus imparting a dwell at the retracted positions of slides *A* and *B*. This type of setting is easily possible by merely adjusting clamp screws *L* and *M*. Each of these screws should be provided with a simple lock-nut arrangement. Provided slide *E* is located at a 90-degree angle to axis *X-X*, and levers *J* and *K* are the same size, then driven slides *A* and *B* will move in synchronism through identical distances in opposite directions.



The ratchets move in unison only when the pawl is able to enter the roots of both ratchet teeth.

Skip-Ratcheting Arrangement

By H. B. SCHELL, Brooklyn, N. Y.

A ratchet and pawl arrangement was required that would move the ratchet only on alternate strokes of the pawl. The movement was obtained by adding a second ratchet having every other tooth modified to form a step.

In the accompanying diagram, ratchet *A* is the one required to move on alternate strokes of pawl *C*. This ratchet transmits the motion to a shaft, not shown, to which it is keyed. The second ratchet *B* is free to rotate on the same shaft. Pawl *C* is wide enough to engage both ratchets.

With the parts positioned as shown, the pawl on its initial stroke carries both ratchets one tooth space to the right. Teeth *X_a* and *X_b* on ratchets *A* and *B*, respectively, advance to the vertical center line, and the relative positions of the ratchets remain unchanged. Then, on its return stroke, the pawl falls from the top of tooth *X_b* onto the step of the same tooth, thus preventing engagement of the pawl with tooth *X_a* on ratchet *A*.

The next forward stroke of the pawl advances only ratchet *B*, since the radius of the step is greater than the outside radius of ratchet *A*. This movement of ratchet *B* aligns tooth *W_b* with tooth *X_a*. On the next return stroke, the pawl falls into the roots of teeth *W_b* and *X_a* so that the subsequent forward stroke of the pawl advances both ratchets.

Since the step on every other tooth of ratchet *B* produces the movement of ratchet *A* only on alternate forward strokes of the pawl, it is apparent that other spacings of the steps can produce variations in the skip-ratcheting arrangement.

TOOL ENGINEERING

Ideas

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Indexing Fixture for Locating Bolt Holes

By JOHN J. FITZGERALD, Cornell University, Ithaca, N. Y.

High-vacuum systems designed for research application require the use of many bolted flanges to facilitate assembly, cleaning, and inspection. To simplify laying out the bolt-hole circles and the individual hole center lines, the illustrated fixture was constructed. An 0.500-inch diameter hole is first drilled and reamed through the center of the flange to be laid out. The flange is then placed over stud *A* of the fixture. A micrometer, set to the radius of the bolt-hole circle plus an additional 0.500 inch, is used to position plunger *B*. The 0.500 inch is added to the radius dimension because both the stud and the plunger are 0.500 inch in diameter.

After the plunger has been accurately positioned, it is locked in place by tightening knob *C* at the split end of support arm *D*. Plunger *B* is now in position to be used as a center-punch.

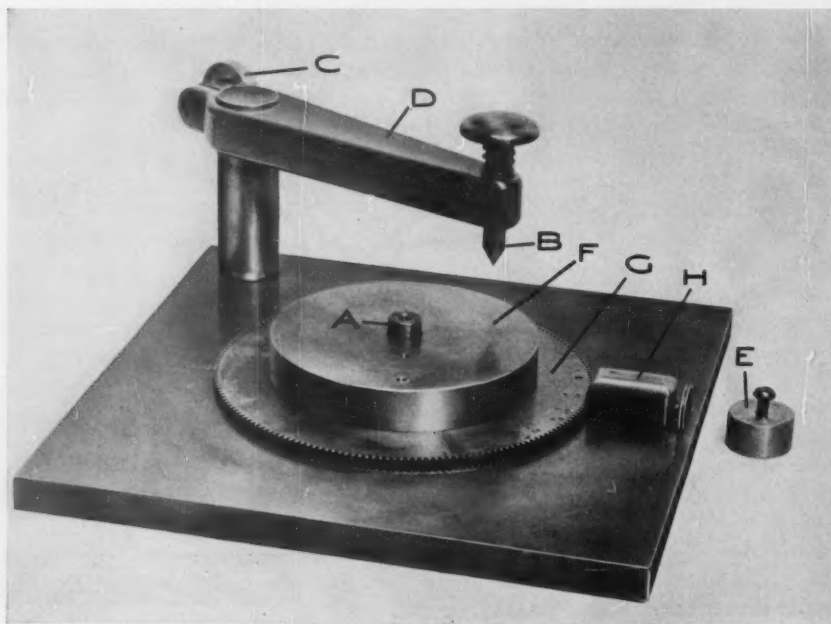
Washer assembly *E* is placed over stud *A* and screwed in place. This clamps the flange blank to index-plate *F* which is secured to a 180-tooth,

32-pitch gear *G*. The gear teeth are numbered and, by means of a single index-finger mounted in housing *H*, the following groups of equally spaced divisions can be obtained: 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 30, 36, 45, 60, 90, and 180. With the addition of a second index-finger accurately located to position gear *G* at one-half tooth intervals, this range would be increased.

Adjustable Heads for Boring Cutters

By W. M. HALLIDAY, Southport, England

Boring operations often are performed by setting up two single-point cutters diametrically opposite each other in a block type boring head. By dividing the chip load between them, the cutters can be fed at twice the rate used for one cutter, with no increase in power requirement. Also, the opposing action of the two cutters balances the thrust forces imposed on the boring-bar, in order that a more perfectly round hole may be obtained.



Fixture permits indexing and center-punching of equally spaced bolt holes located on a common circle.

Fig. 1. Distance x is obtained by advancing set-screw D , then tightening cap-screw E .

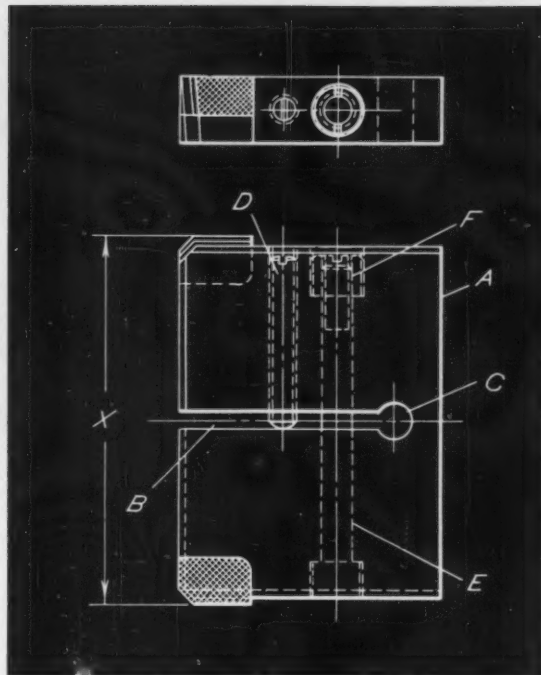
Where the cutting elements are brazed directly to the boring head, it is necessary to provide some means of adjustment, so that after each regrinding the required hole diameter can still be maintained. Two practical arrangements are shown in Figs. 1 and 2, respectively.

In Fig. 1, the head A has a central slit B for the major portion of its length to a stress-relief hole C . A headless set-screw D engaged in a tapped hole in one half of the head has an end contact with the other half of the head. Intersecting the slot and running completely through both halves is a drilled hole containing a cap-screw E . Both ends of this hole are counter-bored so that the head of the cap-screw and its nut F are below the surface of the boring head.

The cutters are initially rough-ground so that when brazed in position the distance x is a few thousandths inch greater than the required bore diameter. Then, when the head is used for the first time, set-screw D is adjusted to exert a light, end pressure across the slot and cap-screw E is tightened. A reading of distance x is taken with a micrometer, and the cutters are finish-ground an appropriate amount.

Whenever the cutters require regrinding, the cap-screw is loosened, the set-screw is advanced until the distance x is slightly greater than the required bore diameter, and again the cap-screw is tightened.

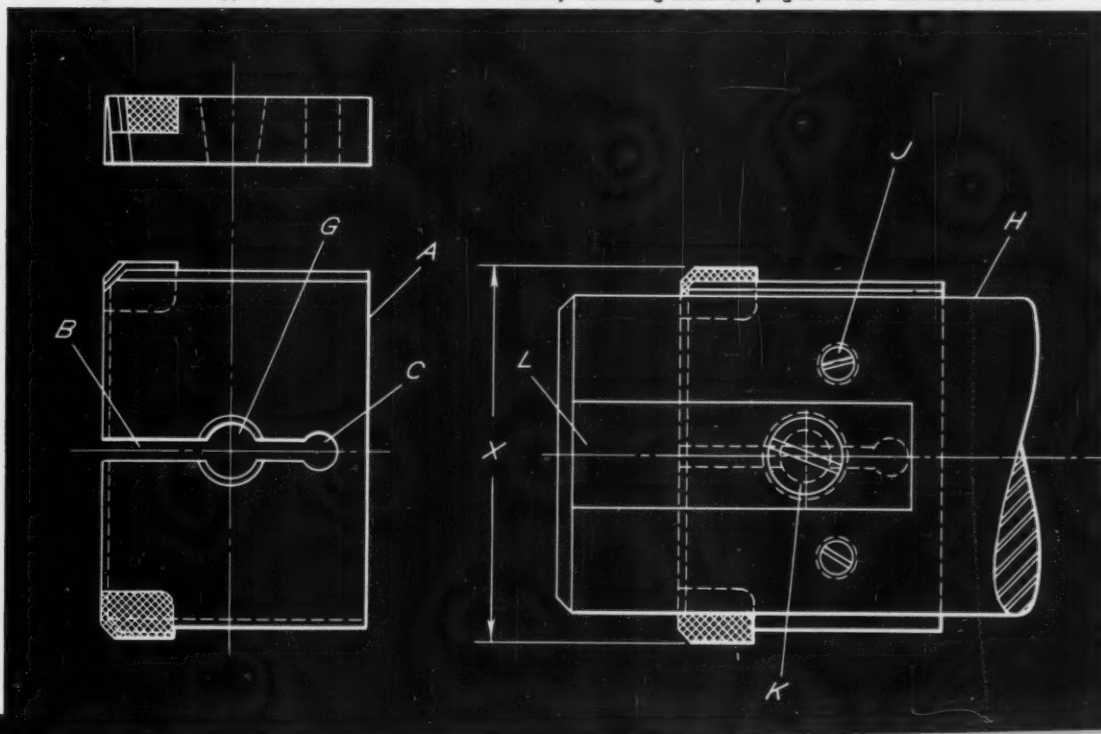
The head A , Fig. 2, also has a central slit B

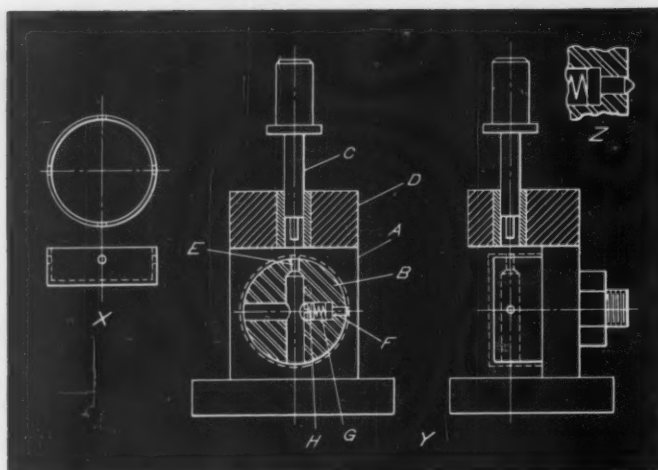


extending to a stress-relief hole C . Prior to slitting the head, a conical hole G is formed. The head is accommodated in a rectangular area near the end of the boring-bar H , where it is retained by set-screws J . A threaded plug K engaging a tapped hole in a milled flat L on the bar has a conical point which contacts surface of hole G .

In adjusting the cutter, the plug is advanced into hole G until a micrometer reading of dis-

Fig. 2. In this type of head, distance x is obtained by advancing threaded plug K farther into conical hole G .





Pin F engages each hole in sequence after the cup is pierced and rotated 90 degrees

tance x shows it to be slightly greater than the required bore diameter. The set-screws J are then tightened and the cutter is ground to size.

Either head, when casehardened, will have additional slit "springiness" through its ability to resist a greater tightening load without deformation.

Automatic Locating Fixture for Sequential Piercing Operation

By FEDERICO STRASSER, Santiago, Chile

A simple punch-press fixture with an integral indexing pin permits the rapid piercing of four small holes in the wall of a cup. The holes, spaced 90 degrees apart, are produced in sequence without taking the cup from the fixture.

In the illustration, the cup is shown at X, with a cross-sectional and side view of the fixture at Y. Bolted to the upright block A of the fixture is a stub arbor B, the outside diameter of which is made to a sliding fit with the inside diameter of the cup.

The punch C is of conventional design, and operates within a bushed guide plate D, entering the piercing hole E on the vertical center line of the arbor in the plane of the punch. A shouldered pin F is on the horizontal center line. It is shown enlarged in view Z.

The pin has a conical point which projects slightly from the arbor periphery, in which position it is normally kept by the pressure of a spring G against the pin shoulder. Set-screw H takes the thrust of the spring.

When loading a cup, the pin is forced in. After the first hole is punched, the cup is manually rotated 90 degrees toward the pin, which is now free to move out and engage the hole. When the cup is rotated after the second hole is punched,

the pin is automatically forced in, moving out to engage this hole when it is opposite the pin. The cup is then properly located for the piercing of the third hole. The fourth hole is produced in an identical fashion.

* * *

Universities to Show Research Results at Production Engineering Show

Eight universities will make an unprecedented joint presentation of their latest research to industrial executives at the Production Engineering Show at the Navy Pier, Chicago, September 6 to 17. The universities are: Case Institute of Technology, Cornell University, Illinois Institute of Technology, University of Illinois, Massachusetts Institute of Technology, University of Michigan, Northwestern University, and Ohio State University.

The exhibits, which may have important influences on production techniques of the future, will be the most comprehensive of their nature ever attempted. They will present findings in both pure and applied research in the physical sciences. Among the outstanding displays will be the first operating scale model of a nuclear reactor for industrial uses ever shown publicly. Also to be highlighted are: Research in high-speed metal cutting with a torque dynamometer and a thermocouple capable of measuring temperature between a high-speed tool and a surface being machined during the actual cutting operation; punched-tape control for milling machines; research in the machining of titanium and aluminum; design of very short journal bearing for proper lubrication and load carrying; and a complicated "random programmer" which assures that products selected for testing from the production line are chosen at random.



Talking With Sales Managers

By BERNARD LESTER
Management Consulting Engineer

How Will Automation Affect Sales?

AUTOMATION presents new problems to many sales managers and sales engineers of equipment built for the metal-working industries. Since automation takes place through harnessing special purpose machines or tools actuated and timed by a governing control, it is necessary to understand how individual types of equipment will fit into a whole manufacturing line. Automation may well stimulate changes in the design of a machine builder's products.

Sales personnel must be better informed on new equipment that accomplishes automatic control, and they must keep abreast with the rapid developments initiated by control engineers. One electrical manufacturer is introducing a new system of control that employs magnetic impulses and replaces mechanical contactors.

Old forms of selling, which depend mainly on friendship and pleasant talk will gradually disappear, and exact technical knowledge will take their place. With new engineering principles and devices involved, the machinery salesman must be more alert and certainly better trained. Moreover the salesman must act as a technical scout. He must be quick to report new accomplishments to his headquarters.

No sales manager can afford to neglect the revolution that automation is bringing about. Here are pin-pointed a few questions that will be asked of him:

1. What changes should be made in the type and design of specific equipment to enable its integration into a family of operative units that constitute a whole?
2. Is the sales department well organized and manned to meet changed customer and market interests?
3. What additional specialized talents are required at headquarters, or in the field, that will assist in solving customers' problems arising from advances in the use of automatic processes?
4. Should changes be made in customer lit-

erature and technical data to meet better the growing market interest in automation?

5. Since new applications of specific equipment are made by sales engineers in scattered locations, how can application data be best collected, tailored, and furnished to all?

6. Are we approaching a time when one equipment builder will sell to another to a greater extent than in the past?

7. Will the machine-tool dealer's position change, as selling a group of machines to be used together rather than individually becomes more pronounced?

8. Companies are now springing up that specialize in the development, design, assembly, and installation of automation systems. What steps should be taken to follow their activities and gain their support for a machine builder's products?

The sales manager's greatest responsibility is to train his sales engineers. When methods are rapidly advancing, no avenue for communication equals the trade and technical press. Many new ideas are described in articles that deal with new phases of machine grouping for various processes, new circuits, and new forms of automatic control. Sales engineers with the limited time at their disposal, should be directed to those which are pertinent. Automation has opened up new opportunities for the manufacturers and users of production equipment because it has presented new vistas for improving products and reducing costs.

Sales forces must remember, however, that automation has some disadvantages as well as merits. It may well yield amazing results for an existing repetitive process and yet necessitate a large expense when a radical alteration is made in the ultimate product. Economic thinking plays a vital role in the extent of its use, as does social responsibility because of ticklish problems of man displacement for certain duties.

LATEST DEVELOPMENTS IN

Shop

"Hydrospin" Developed to Automatically Cold-Spin Cones and Tubes

A heavy-duty machine called the "Hydrospin," designed for cold-spinning cones and tubes, has been introduced by the Process Machinery Division of the Cincinnati Milling Machine Co., Cincinnati, Ohio. The standard machine is built in a 42- by 50-inch size, in

both plain and duplex models. Special sizes can also be built to order.

The new machine has the capacity to cold-spin regular contoured hollow cones and tubes up to 42 inches in diameter by 50 inches long. Unit pressures as high as 400,000 pounds per square

inch are developed by the spinning operation. This pressure is said to be sufficient to roll a flat disc of AISI 4130 steel 3/4 inch thick into a straight-wall cone having an included angle of 60 degrees in one pass of the rolls. Parts can be spun from flat discs, preformed blanks or rings of virtually any kind of ductile metal. Mill-rolled sheet and plate stock, forgings, and castings may all be processed by Hydrospinning. Besides giving the part the desired shape, it is claimed that this process usually increases the tensile strength and hardness of the material and its resistance to fatigue failure.

The Hydrospin machine consists primarily of a heavy, welded-steel bed which rigidly supports the headstock, tailstock, and the main slide units. The duplex machine has two main slides, while the plain machine has only one. T-slots in the bed permit universal positioning of the main slides which support the roller carriers. The hydraulically powered roller carriers are independently controlled and may be traversed simultaneously or individually, depending upon the spinning operation. Tubes up to 42 inches in diameter can be formed by placing the slides parallel to each other so that the rollers are opposed. Cones of any included angle can be produced—often in one pass. Dishing or beading operations can also be performed on disc-shaped parts.

When justified by high-production requirements the machine can be set up to operate economically through a Hydrospinning cycle in which the movements of the saddles, cross-slides, and tailstock, and the starting and stopping of the spindle are all automatically controlled. To facilitate setting-up

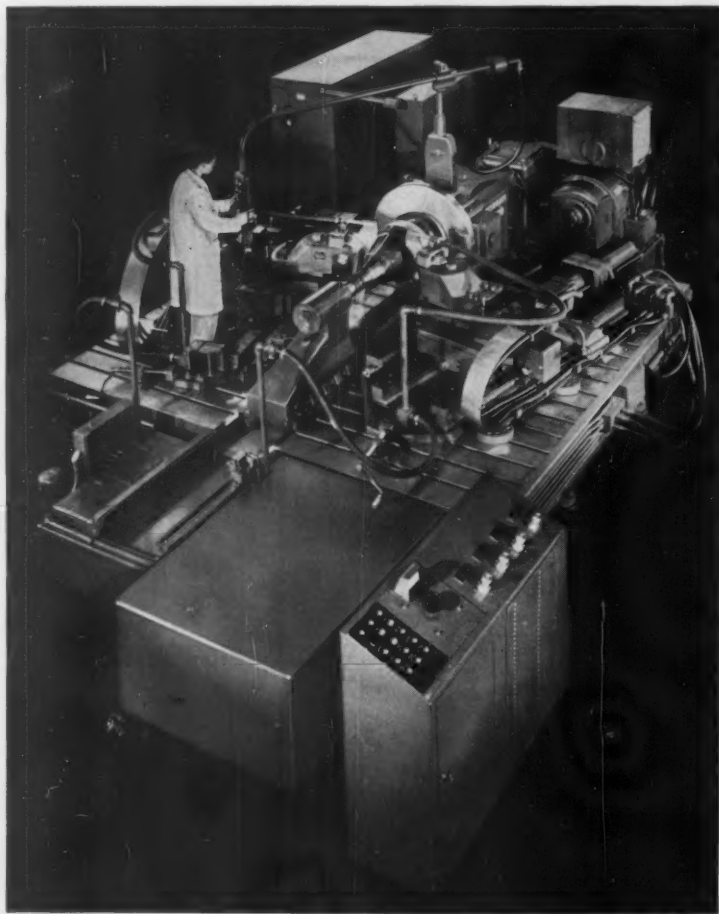


Fig. 1. Cincinnati hydraulically controlled Hydrospin with universally adjustable main slides and opposed rollers, for cold-spinning cones and tubes

Equipment

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON

operations the machine can be operated manually by push-buttons.

The machine can be equipped with a 50- to 60-H.P. motor for the infinitely variable-speed drive to the heavy-duty spindle. The spindle is provided with tapered roller bearings designed to support both radial and thrust loads. High peripheral loads on the 36-

inch diameter faceplate can be supported through the use of an outboard roller mounted on the side of the headstock.

The tailstock holds the workpiece and mandrel rigidly on its center and is hydraulically actuated. The center can be positioned within a range of from 20 to 100 inches from the faceplate. High-

capacity radial and thrust bearings are used in the tailstock unit.

Feed rates for both the saddle and cross-slide are hydraulically controlled and infinitely variable. Two 7 1/2-H.P. motors drive the hydraulic pumps which provide the power for these movements. Longitudinal feed rates are infinitely variable between 0 and 60

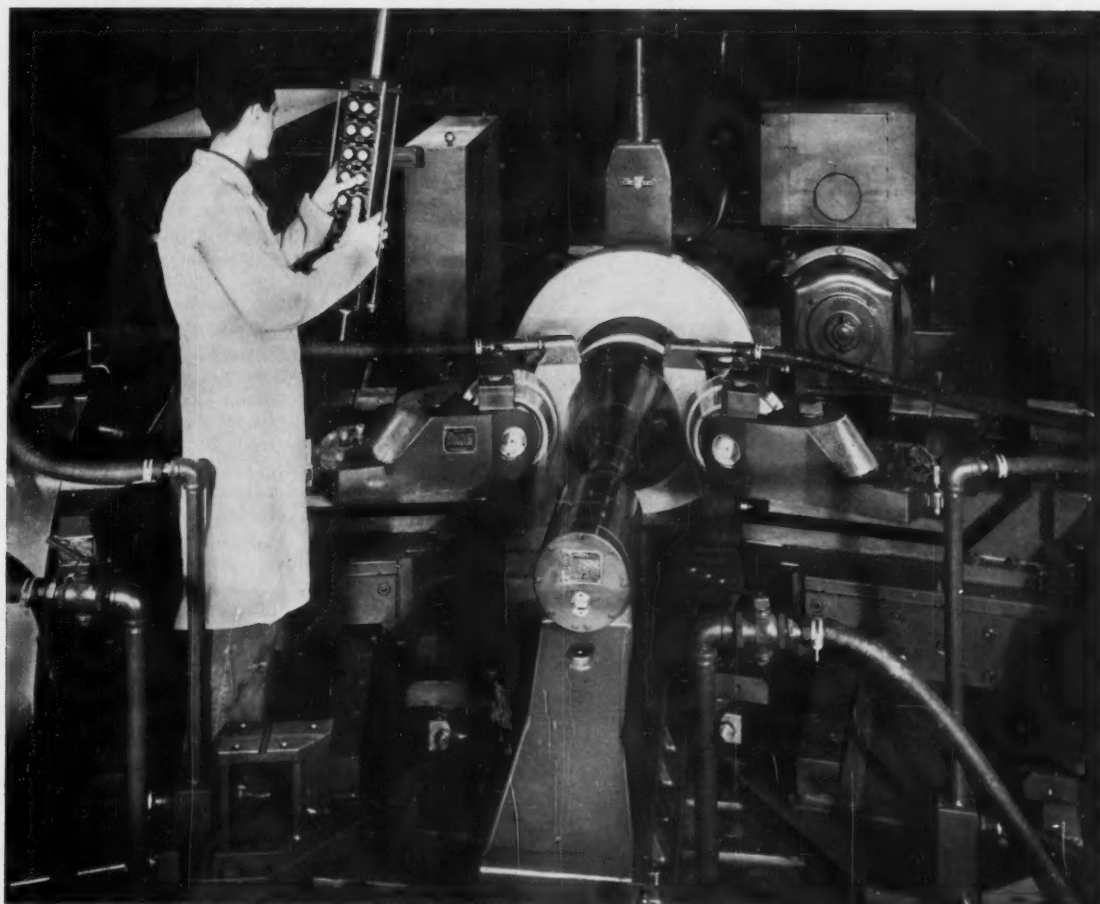


Fig. 2. Close-up of machine shown in Fig. 1 which can be manually controlled by push-buttons, or set to operate through a completely automatic Hydrospringing cycle. Coolant for flooding the work is supplied by a forty-gallon-per-minute system

inches per minute when one slide is used and 0 to 30 inches per minute when both slides are used. Cross-slide feed rates vary from 0 to 54 inches per minute using one slide, and 0 to 27 inches per minute when using both slides. Power rapid retraction is provided for the longitudinal slide, cross-slide and tailstock.

The roller carriers are so designed that the tool equipment can be changed quickly and easily. Each roller carrier supports a roller, a set of roller bearings, and a tool-ring. The carriers are arranged so that the tools can be changed without disturbing the setting of the roller bearings.

A hydraulic contour-tracing attachment is available for use with the new machine. With this attachment mounted on the cross-slide, parts with curvilinear wall sections or multiple-diameter tubes can be formed, as well as parts having straight sides. A turning attachment and a mandrel grinding attachment are also included among the extra equipment items designed for use with the Hydrosin. The former is useful in development work for turning, facing, and cut-off operations after Hydrosin. The grinding attachment, which is equipped with Filmatic spindle bearings, can be used to finish-grind forming mandrels mounted on the faceplate.

Circle Item 101 on postcard, page 245

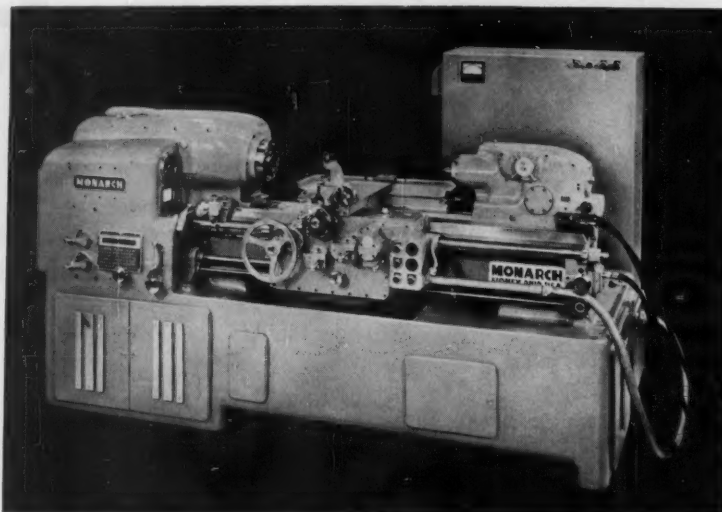


Fig. 1. Precision turning lathe for manufacturing and toolmaking applications developed by Monarch Machine Tool Co.

Monarch Precision Turning Lathe

A precision turning lathe developed for both manufacturing and toolmaking applications, is announced by the Monarch Machine Tool Co., Sidney, Ohio. This machine is especially designed to reduce set-up and turning time without sacrificing accuracy. Designated the Series EE, Model 1000, it is well equipped to serve as a precision machine for the master toolmaker. An important

design feature is the all-electric speed-control mechanism which provides infinitely variable cutting speeds. A single electric control knob can be operated to provide any desired speed within the particular range selected. Four hydraulically actuated speed ranges are available which can be shifted automatically upon the setting of a range selector switch.

The machine is equipped with a built-in mechanism for maintaining a constant surface cutting speed which can be used to advantage on multiple-diameter shaft work. The selector switch is simply set to the desired cutting speed for the part to be turned. This speed is then maintained automatically.

An electronic rectifier system in a separate control cabinet, provides power for the 20-H.P., direct-current variable-speed motor. This system has sufficient capacity to operate the motor at 30 H.P. without excessive overloading. A meter permits the load on the motor to be observed at any time.

Motor control and load compensation mechanism, also housed in the control cabinet, are handled electronically by means of vacuum tubes and relays. A blower supplies forced draft cooling for tubes and transformer units and all relays are mounted in a separate cabinet compartment which is sealed to prevent dust from entering the contact areas.

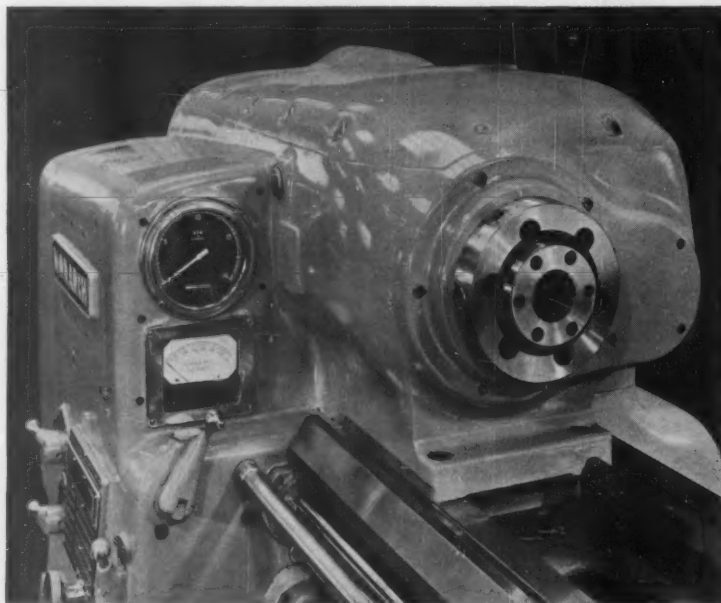


Fig. 2. Headstock of Monarch lathe equipped with large tachometer and surface-feet-per-minute indicator

Lake Erie Heavy Forging Presses

The apron provides power rapid traverse to both the carriage and the cross-slide. Power for the rapid traverse is supplied by an individual motor-driven unit equipped with a safety clutch which releases automatically in case of accidental jamming. The two-speed hydraulic tailstock incorporates hydraulic clamping and unclamping, plus a slight lifting action supplied by spring-loaded rollers.

Either pushing or pulling the control lever causes automatic unclamping. As long as the operator continues to exert moderate pressure on this lever the tailstock may be moved in either direction with ease. Instant and automatic reclamping takes place when the control lever is released. Tailstock spindle travel is by means of hydraulic power with finger-tip control. There are two handwheels: one to control a fast-traverse movement, the other a slow-feed movement. Only the slightest effort is required to feed tiny drills or large counterbores. Hydraulic power does the work.

The headstock has four infinitely variable, overlapping speed ranges—forward or reverse. Any speed between 25 R.P.M. and 2000 R.P.M. may be obtained. The headstock spindle is hardened and ground and has a standard 6-inch Camlock nose. The spindle also is equipped with a dynamic brake which can arrest rotation in two to three seconds from even the highest speed. "Neutral" setting of the range selector switch permits the spindle to be turned freely by hand. Lubrication of headstock gears is through a combined mist and liquid filtered system.

The quick-change gear-box provides for cutting sixty-six different thread leads and has an equal number of turning feeds. The range of threads per inch is 2 to 120, while the range of feed per revolution varies from 0.001 to 0.066 inch. Flame-hardened bedways for both the carriage and tailstock have a Shore scleroscope hardness of 70 to 72 and are precision ground. A ball-bearing taper attachment, direct-length reading dial, dial-indicator carriage stop, steadyrest, follow-rest and apron-controlled lead-screw reverse are included as regular equipment supplied with this machine.

Circle Item 102 on postcard, page 245

Advanced design principles have been incorporated in an 8000-ton hydraulic forging press recently built by the Lake Erie Engineering Corporation, Buffalo, N. Y. This down-stroke, column type press is accumulator-operated with a water pressure of 4500 pounds per square inch, and will be used for forging heavy aluminum billets.

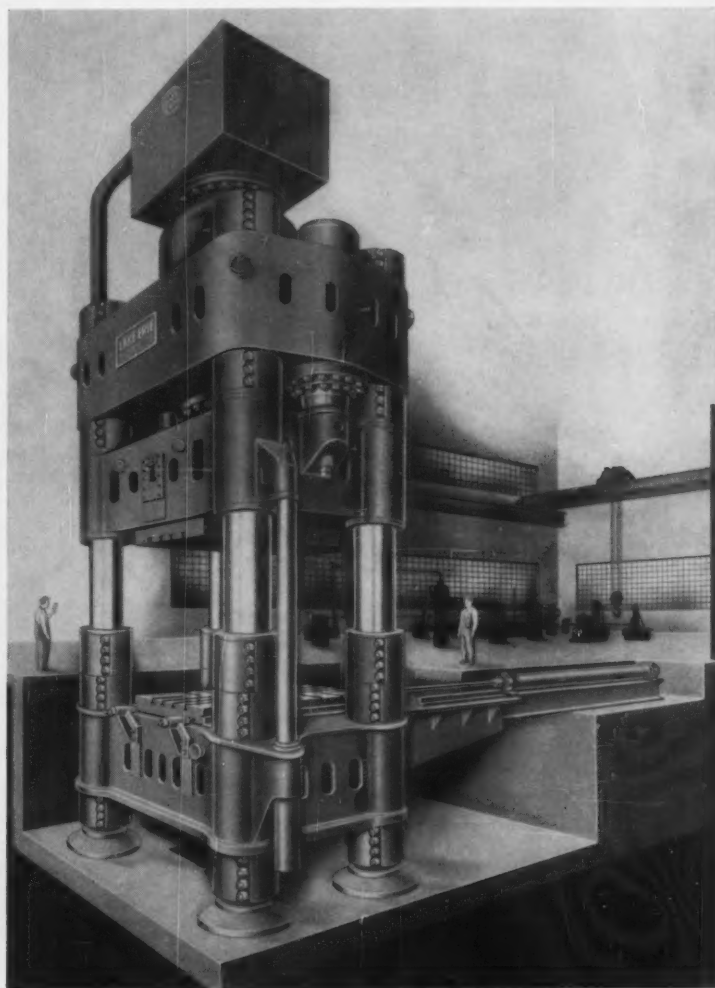
The working area between positive stops on this press is 98 inches left to right and 58 inches front to back. The main columns are 28 inches in diameter. Both main and side rams have a stroke of 72 inches, and the ejector has a stroke of 12 inches. Maximum daylight capacity is 110 inches; and minimum daylight capacity 38 inches. A sliding bolster arrangement provides a stroke of 112

inches to facilitate removal or replacement of dies.

The press ram speeds for the closing, pressing, and return strokes, and for ejection are 400, 250, 350 and 1000 inches per minute, respectively. The main ram has a capacity of 5335 tons while each side ram has an operating capacity of 1485 tons.

The special design features include chromium-plated rams to eliminate rusting, and cylinders which are of inserted forged steel. The platens have been designed for eccentric loading. This press and two 4000-ton forging presses have been furnished as auxiliaries to the aircraft heavy-press program and will be used by Harvey Aluminum, Division of Harvey Machine Co., Inc., Torrance, Calif.

Circle Item 103 on postcard, page 245



Improved heavy forging press built by Lake Erie Engineering Corporation

Universal Burr-Master for Chamfering Teeth of Internal Gears

A universal Burr-Master for deburring and chamfering the teeth of internal gears has been announced by the Modern Industrial Engineering Co., Detroit, Mich. Splines and the teeth of straight-sided or involute-form helical and spur gears having pitch diameters ranging from 2 to 20 inches with a maximum of four diametral pitch can be deburred and chamfered on this BMI-15 machine. The throat clearance permits the handling of parts with outside diameters ranging up to 22 inches.

This machine chamfers both sides of the tooth and the root at one time at the rate of 5 teeth per second. With adaptations in the tooling it can also be used to deburr and chamfer certain types of external gears. The only tooling components that need be changed

when shifting from one job to another are the spline driver, work-holding fixture, tool-holder and form tool, and the change gears.

A circular type form tool with three or four cutting edges for deburring and chamfering insures long tool life and reduces the time required to get a sharp cutting tool into position. When one cutting edge becomes dull, the tool need only be rotated to present a sharp cutting edge. Only the cutter-locating face is ground when resharpener the tool.

The machine has been designed

to enable even an inexperienced operator to maintain a high production rate. Dual starting buttons located on opposite sides of the machine provide protection for the operator's hands. After one complete revolution of the work-piece the cycle timer stops the cutters in the retracted position to simplify unloading, and a green indicator light on the control panel signals that the part is deburred and chamfered.

The machine has an over-all height of 80 inches and a work-height of 38 inches. It weighs about 2500 pounds and requires a floor space 38 by 46 inches.

Circle Item 104 on postcard, page 245

Honing Machine with Electronic Speed Control

Electronically controlled spindle speed is a feature of a Model "5" honing machine now being

manufactured by the Staple Engineering Co., Birmingham, Mich. Infinitely variable speeds ranging



Burr-Master built by Modern Industrial Engineering Co.



Staple honing machine with electronic speed control

from 160 to 1600 R.P.M. are available for honing inside or outside work from 1/8 to 1 inch in diameter. The spindle speed is varied by a small lever switch and can be increased or decreased without stopping rotation.

Light pressure on a long pedal, which may be operated by either foot, releases the brake, starts the spindle rotating, and feeds the honing stones out to an adjustable pre-set stop. Releasing the pedal retracts the stones or hones, cuts off the power, and applies a brake designed for quick stopping of spindle rotation.

Two swinging doors, one on each side of the machine column, have racks for holding tools of various sizes. A coolant pump and tank are also assembled in the column. Seven tools of different models are supplied for use in the machine. Five tools are for inside diameter and two for outside diameter work.

Circle Item 105 on postcard, page 245

Erie Board Drop-Hammer of Giant Size

A huge board drop-hammer having a rated capacity of 10,000 pounds was built recently by the Erie Foundry Co., Erie, Pa. The four-roll design of the lifting head of this hammer is designed to give longer board life and permit construction of board drop-hammers in much larger sizes than is possible with the two-roll design. The hammer is equipped with air-operated board clamps which are released by air, and set by a weight. Air-actuated clamps serve to reduce the effort required to operate the hammer. All major parts of this hammer which are subject to impact forces are made from cast steel.

The hammer illustrated is now being used by the Eaton Mfg. Co. at their Marion, Ohio, plant where one of the largest forgings being made is a flat-back ring gear having a net weight of 68 pounds.

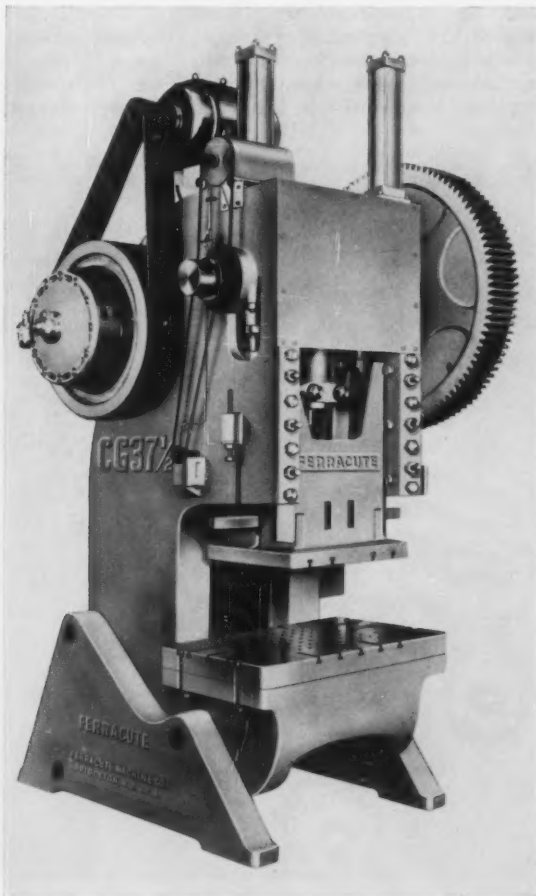
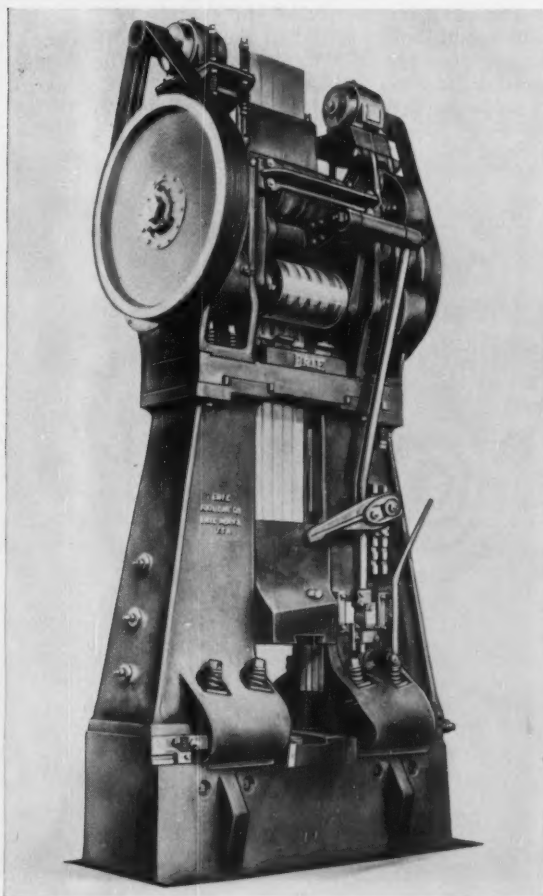
This gear is forged straight down in a single impression die without being blocked or pancaked.

Circle Item 106 on postcard, page 245

Ferracute Open-Back Inclined Presses

A line of 110-, 150-, and 200-ton inclined presses designed to meet the specific requirements of cutting, punching, stamping, shallow drawing, and forming operations has been announced by the Ferracute Machine Co., Bridgeton, N. J. These presses are said to embody all the outstanding design features of previous models brought out by this company and are built to meet J.I.C. press standards. They will accommodate any type of automatic or semi-automatic feed attachments.

For completely automatic operation, single- or double-feed rolls, ratchet dial, friction dial, magazine or chute feeds can be combined with a hopper, lower cam or



Huge board drop-hammer recently built by Erie Foundry Co. Inclined press announced by Ferracute Machine Co.

crank knock-out, and inspection station. Model C Dayton-Rogers bed-mounted die cushions can be installed for drawing medium-gage metal. The presses are equipped with air-powered electrically controlled Ferracute automatic friction clutch and inter-connected brake. This equipment

is designed to provide a quick, safe, and extremely accurate control for punch presses requiring start-stop operation. The design of the interconnecting assembly permits quick and positive single-point adjustment of the braking system.

Circle Item 107 on postcard, page 245

Colonial Non-Stop "One-Way" Surface Broaching Machine

A surface broaching machine of radically new design designated as the "One-Way" has been announced by the Colonial Broach & Machine Co., Detroit, Mich. This new machine is said to achieve virtually continuous metal removal through a series of broach carriers mounted on an endless chain.

The broach carriers move downward on the front of the machine, entering precision ways before contacting the work to insure accuracy. The part being broached remains stationary in holding fixtures on the work platen. After entering the ways, the broach carriers become individual rams. The chain applies only a down-pull on the ram.

Gibs and ways support the ram while the broach teeth are cutting, as with conventional surface broaching.

The chain broach principle provides a greatly increased length of broaching "stroke" in a relatively small machine. The Model VCA-10-150 "One-Way" machine seen in Fig. 1 stands only 11 1/2 feet high but has an effective broach length of 12 feet 10 inches. It will be shown publicly for the first time in Booth 1112 at the Machine Tool Show in Chicago.

A completely mechanical drive, including a variable-speed unit, provides the machine with any desired cutting speed within the range of from 10 to 50 surface

feet per minute. The variable-speed feature enables the machine to broach a wide variety of materials at optimum cutting speeds. Pulsations and vibrations are said to be eliminated by the mechanical drive.

The wide face for mounting broaches on the chain-driven rams and the wide work platen for handling indexing or stationary fixtures permits installation of multiple tooling for simultaneous broaching of the same or different parts side by side. If the parts being broached require less than half the available stroke (12 feet 10 inches on the standard machine), duplicate tooling can be installed in sequence on broach carriers and controls modified to provide two or more complete broaching cycles for each revolution of the chain. Similarly, with suitable broach spacing and control stops, two parts requiring a short stroke and one part requiring a long stroke can be broached side by side during a single revolution of the chain.

Of unusual interest is the fact that the "tower" of the machine is constructed so that it can be raised with extension inserts,

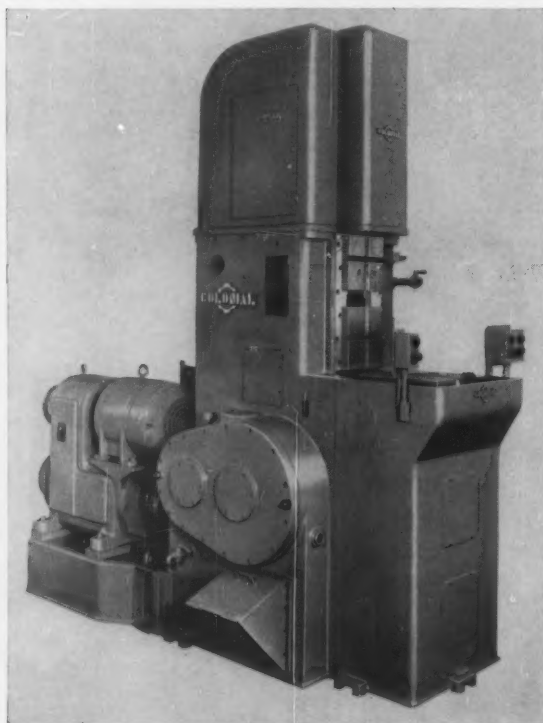


Fig. 1. "One-Way" surface broaching machine built by the Colonial Broach & Machine Co.

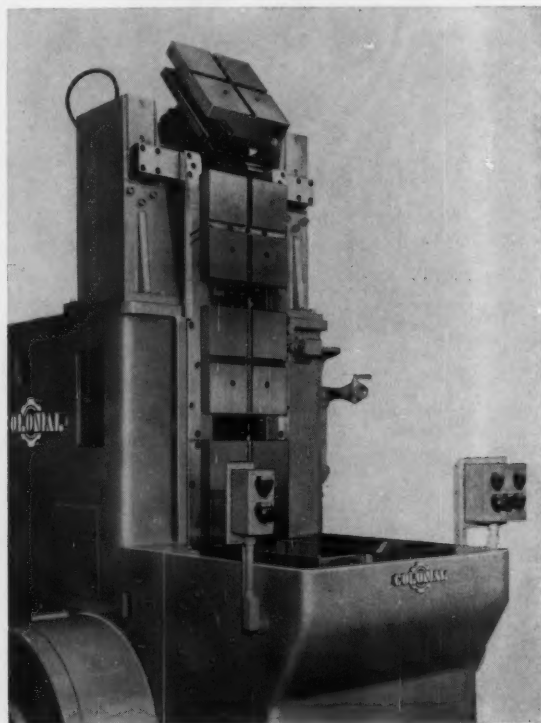


Fig. 2. View of machine seen in Fig. 1 with guards removed to show chain-mounted rams

and a longer broach carrier chain installed. Additional carriers may then be attached to the chain, increasing the effective broaching stroke to as much as 18 feet. The basic model weighs 18,000 pounds, requires a floor space 73 by 152 inches and has a work platen 20 by 22 inches.

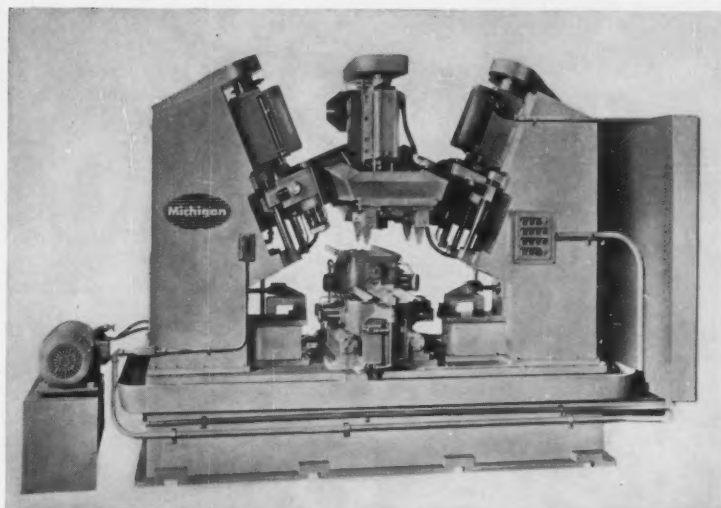
Circle Item 108 on postcard, page 245

Hopper-Feed Mechanism for Screw Machine

A unique hopper-feed mechanism, called the "Auto-Load" designed to automatically feed second-operation parts to an automatic screw machine is announced by the Hi-Shear Rivet Tool Co., Los Angeles, Calif. It is claimed that a Brown & Sharpe automatic screw machine equipped with this mechanism can feed, locate, machine, and eject a wide variety of small pieces automatically with the same facility that it produces parts from bar stock.

For second-operation work, the front and rear cross-slides and six turret positions can be used. With the Auto-load mechanism still attached a simple change-over quickly converts the machine for bar-stock work.

Circle Item 109 on postcard, page 245

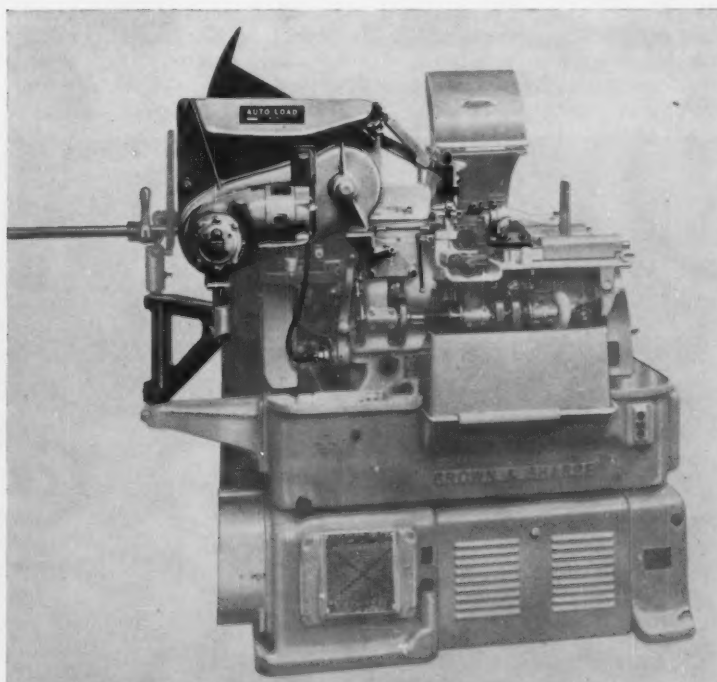
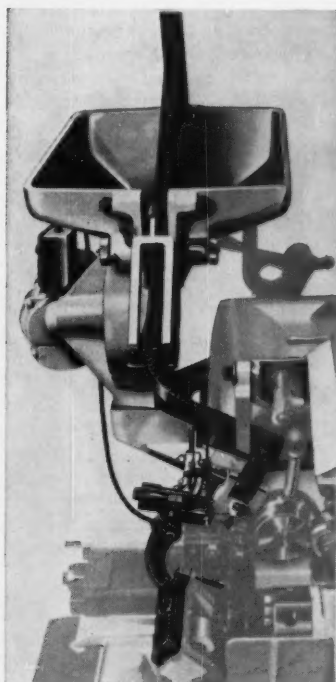


Drilling machine for automobile frames developed by Michigan Drill Head Co

Automatic Drilling Machine with Eight-Spindle "Angle-Matic" Head

The Michigan Drill Head Co., Detroit, Mich., has just announced a special automatic drilling machine that features an eight-spindle "Angle-Matic" head. This machine has been built to drill nineteen holes, at various angles, in an automobile frame at a rate of 160 frames an hour.

The machine automatically positions the frame over the locating pins and automatic elevators immediately lower it into place. Automatic clamps then secure the frame in the drilling position, and all the tools advance. The operation is completely automatic—even the cool-



(Left) Close-up of "Auto-Load" hopper feed. (Right) B & S automatic screw machine equipped with hopper feeding mechanism brought out by the Hi-Shear Rivet Tool Co.

ant is supplied to all tools automatically.

The machine components consist of two five-spindle drill-heads and one single-hole driller mounted on self-contained power units, and one eight-spindle "Angle-Matic" head. The spindles in the "Angle-Matic" head operate in a rather ingenious way: two are fed horizontally to the left, parallel with the front of the

machine; two are fed horizontally to the right; two are fed horizontally to the left, at an angle of 60 degrees to the front of the machine; and two spindles to the right drill at an angle of 60 degrees, using only one feed mechanism. After all nineteen holes have been drilled, the frame is unclamped, raised to the conveyor height, and ejected.

Circle Item 110 on postcard, page 245

Cincinnati "Tray-Top" Engine Lathes

All-gear head, Model LE "Tray-Top" engine lathes in 10-12 1/2-, 15-, and 18-inch sizes have been announced by the Cincinnati Lathe & Tool Co., Cincinnati, O. These lathes are designed to provide the metal-working industry with modern, low-cost, equipment for manufacturing, maintenance, and tool-room use. They are available now and will be displayed at the Chicago Machine Tool Show at Booth 309.

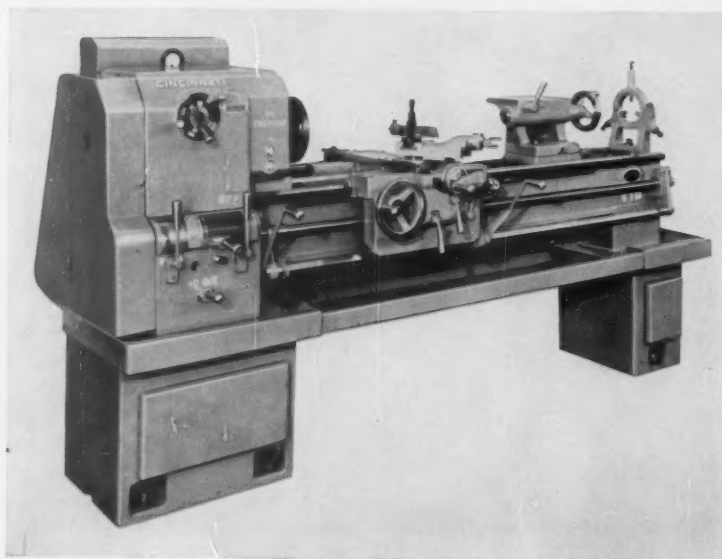
The lathes have twelve spindle speeds in geometric progression, with a three-lever, color-match, direct-reading shifting mechanism. The spindle, with a long-taper key-drive nose, is rigidly mounted in three precision anti-friction bearings. All headstock bearings are pressure lubricated with filtered oil. Forty-eight thread and feed changes are made available through a totally enclosed, automatically lubricated quick-change gear-box. The one-

piece, double-walled cast apron has automatic lubrication. Longitudinal and cross feeds are engaged with drop levers which operate positive-jaw clutches. A spindle start-stop control lever is supplied at the apron and quick-change gear-box.

The bedways are ground, and when requested they will be "Hardclad" flame-hardened. Lubrication of the carriage ways and cross-slide is provided by an oil-shot system in the apron. The electrical control equipment is enclosed in a safe, accessible compartment. A built-in disconnect switch prevents exposing a live panel.

The lathes are offered with a 1-, 1 1/2-, 2- or 3-H.P. motor mounted on the rear of the headstock leg. "Tray-Tops" on the headstock and tailstock provide safe parking space for micrometers, tools, drawings, gages, and other items.

Circle Item 111 on postcard, page 245



"Tray-Top" all-gear head engine lathe built by Cincinnati Lathe & Tool Co.



Ettco-Emrick lead-screw type automatic tapping machine

Automatic Tapping Machine

An Ettco-Emrick A.T.U. No. 3 automatic tapping machine of the lead-screw type is announced by the Ettco Tool Co., Brooklyn, N. Y. This self-contained electrically controlled and operated machine is designed for fast, precision single and multiple-spindle tapping or threading. Electricity is the only power required to operate this machine. Utilizing a new principle of forward and reverse electromagnetic clutches this machine needs no reversing motor and can be operated at extremely high production speeds.

A built-in rheostat control mounted on the side of the machine permits the torque of the clutches to be regulated over a range of from 0 to the equivalent of 2 H.P. This gives the machine the sensitivity required to protect small taps and the power and torque needed to drive the larger taps.

An external depth control knob allows the tap depth to be controlled to within one-fourth turn anywhere within the maximum stroke of 1 7/8 inches. The hardened and precision ground lead-screw, which feeds the tapping head into the work, runs in a

special split lead-nut. Lead-screws and nuts of different pitch may be readily installed.

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Danly "Autofeed" Press

An "Autofeed" press with all controls, the automatic feeding device, and the scrap cutter built in as integral parts of the unit, has been brought out by Danly Machine Specialties, Inc., Chicago, Ill. The result of this internal integration of all controls and accessories is a complete production unit which is ready for immediate operation as soon as it is set in position. No additional control panels or auxiliary equipment installations are required. It is claimed that this new press design provides maximum operating convenience and safety, minimizes danger of damage to controls or accessories, and increases over-all efficiency.

Hinged doors and panels provide quick access to all accessories for periodic servicing. When all doors and panels are closed the machine presents a smooth, clean contour. The press is equipped with automatic oil lubrication and has automatic oil-pressure safety switches. A number of Danly presses and accessories will be displayed and operated at the Machine Tool Show.

Circle Item 113 on postcard, page 245

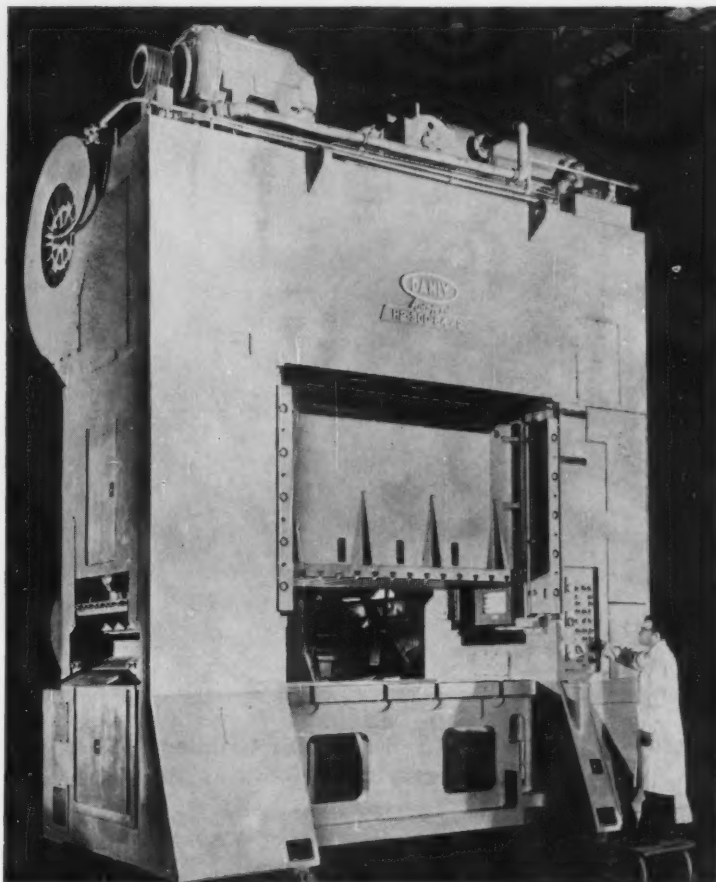


Fig. 1. Danly 300-ton "Autofeed" press with "totally enclosed" accessories. Automatic feeding device and recessed operator's control panel are enclosed in the upright shown at the right and the scrap cutter is built into the upright at the left

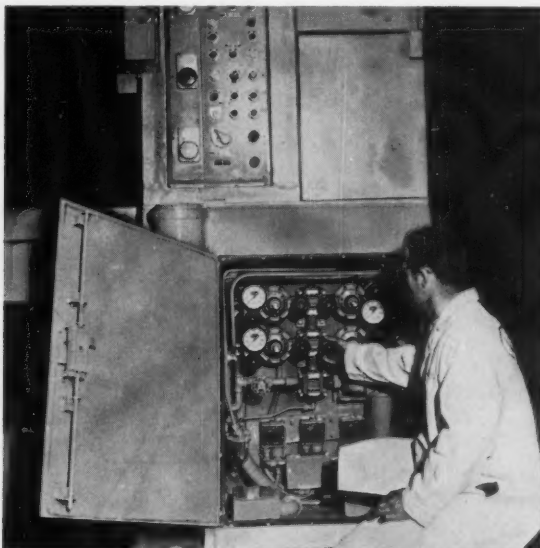


Fig. 2. Air-control manifolds are built into the press upright. A panel totally encloses all air controls

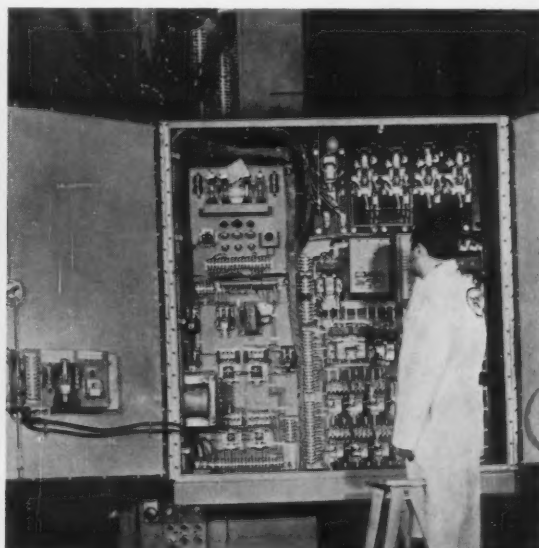
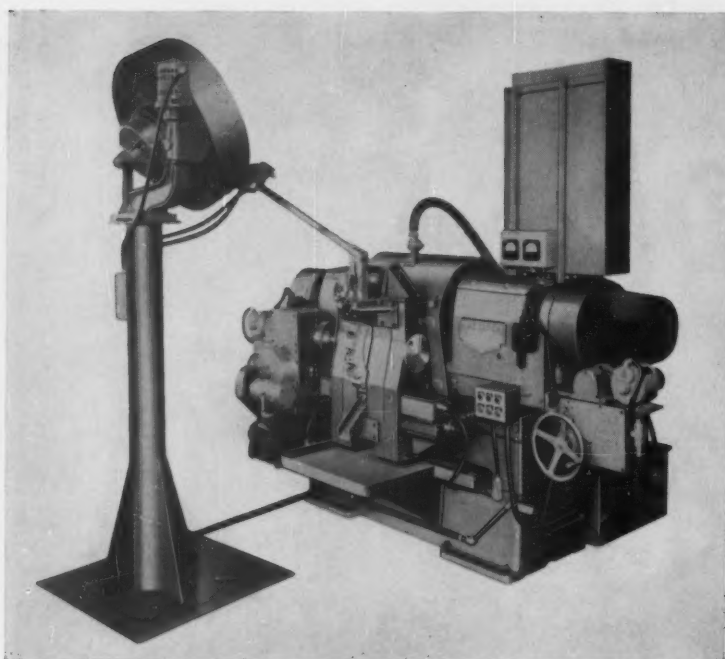


Fig. 3. Built-in master control panel can be closed up tight in operation. Opening doors automatically cuts power



Mattison disc grinder for finishing both ends of piston-pins simultaneously

Mattison Automatic Disc Grinder for Processing Piston-Pins

An automatic disc grinder with hopper feed has been developed for processing piston-pins by the Mattison Machine Works, Rockford, Ill. Pins from the hopper enter a stacking mechanism, from which they are picked up automatically by a rotating carrier plate and clamped in hardened V-

shaped jaws. The carrier plate revolves between opposed grinding wheels which simultaneously remove 0.010 inch of stock from each end of the pins in one pass. Finish-ground pins are unloaded automatically through a chute into tote boxes.

Sizing devices continuously gage

the accuracy of the work. When wear on the faces of the grinding wheels is such that pins approach the high limit of the tolerance, the automatic feed is actuated. This compensates for wheel wear so that only spot checking of the pins for size and squareness is necessary. Production is at the rate of 2100 piston-pins per hour.

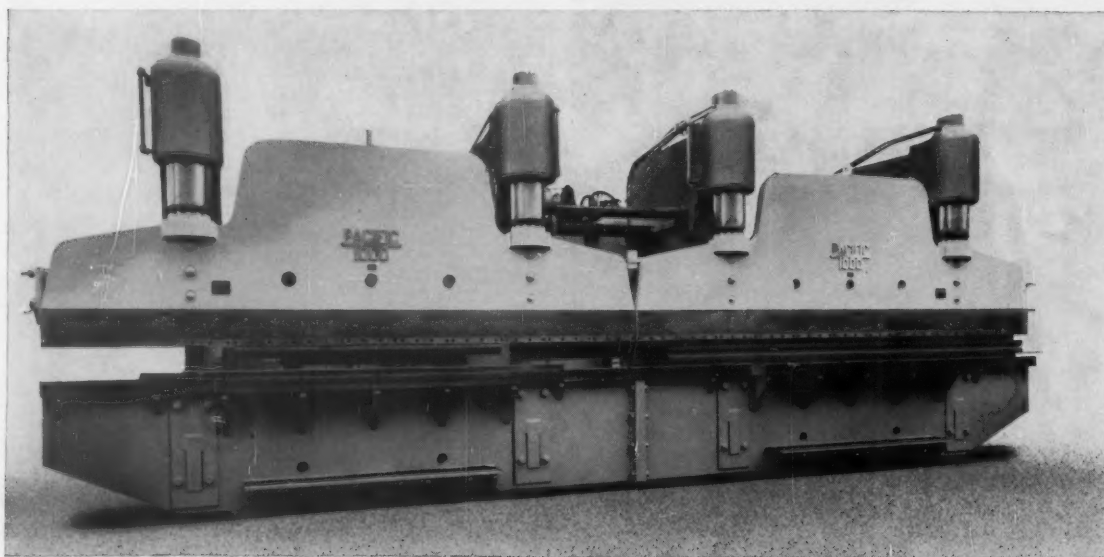
Circle Item 114 on postcard, page 245

Mammoth Hydraulic Press Brake

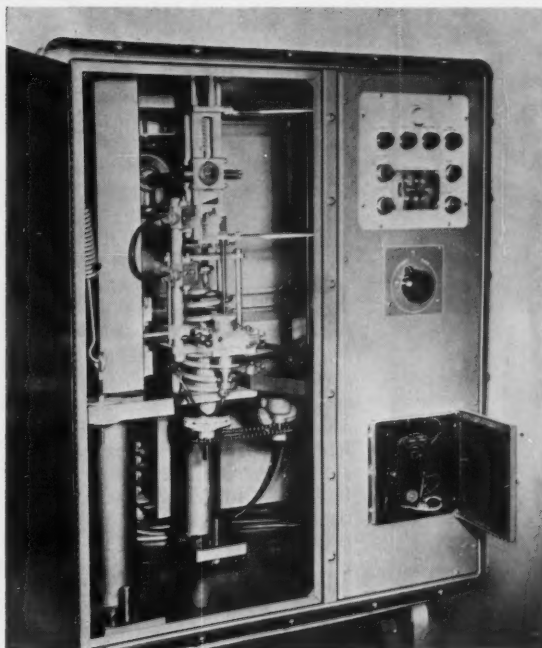
The Pacific Industrial Mfg. Co., Oakland, Calif., has constructed what is believed to be the largest hydraulic press brake of its kind in the world. This mammoth brake is 44 feet long, weighs 365,000 pounds and has a bending capacity of 2000 tons. It is made up of two individual 1000-ton units which are electrically controlled to a tolerance accuracy of 0.001 inch on the depth of stroke by means of a single, foot-operated switch.

The individual units can also be used as separate press brakes. Each unit is 22 feet long and has a capacity of 1000 tons. The illustration shows the standard press-brake dies in the right-hand unit and plate-straightening dies in the left-hand unit. This equipment can be used for all types of metal-forming including bending, punching, drawing, corrugating, blanking, and straightening.

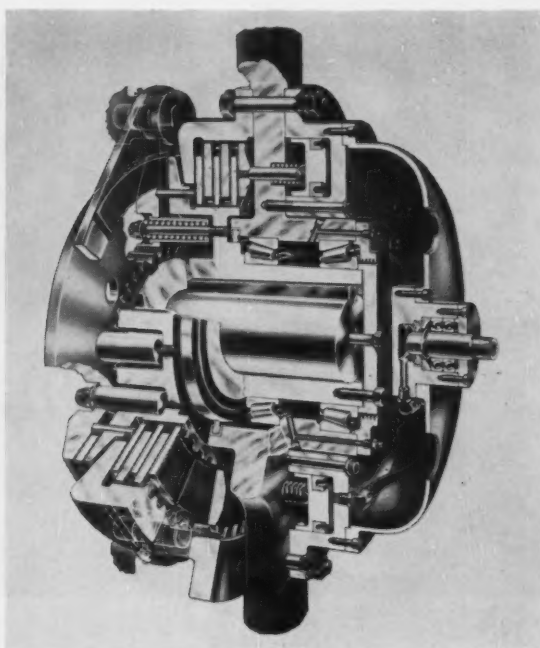
Circle Item 115 on postcard, page 245



Hydraulic press brake of gigantic size built by the Pacific Industrial Mfg. Co.



Sonntag fatigue-testing machine equipped to automatically maintain constant pre-load



Combination clutch and brake for presses brought out by the E. W. Bliss Co.

Sonntag Fatigue-Testing Machine

The Baldwin - Lima - Hamilton Corporation, Philadelphia, Pa. has announced that equipment for automatically maintaining constant pre-load is available on Sonntag simulated service fatigue-testing machines having load capacities of 400 pounds. The necessary additional controls for this equipment can be seen on the panel shown in the accompanying illustration.

The new equipment for the SF-01-U universal fatigue-testing machine corrects automatically for creep which is produced in test specimens such as machine parts or structural components while they are being subjected to constant fatigue loads in tension, compression, bending, torsion, or combined stresses. Fatigue loads are produced in these machines by the centrifugal force of an eccentric mass rotating at 1800 R.P.M. Deflections vary with the condition of the material under test. With a maximum pre-load of 200 pounds, the maximum movement of the vertically reciprocating load platen is 0.625 inch with a tolerance of ± 0.312 inch. Maximum movement without pre-load is 1 inch with a tolerance of ± 0.5 inch. The machine has a working

table 22 1/2 by 29 1/2 inches located 42 inches from the floor. Circle Item 116 on postcard, page 245

Clifton Hydraulic Press

Production of a self-contained all-purpose hydraulic press called the Model 3A has been announced by the Clifton Hydraulic Press Co., Clifton, N. J. This press has been designed particularly to meet the problem of heavy production schedule requirements. It utilizes a power return and such rugged construction features as a heavy-duty platen and platen guide assembly.

The press, available in tonnage capacities of 50, 100, 150 and 300 tons, is equipped with the "Unitrol" unit, a special single-control device developed to eliminate piping and plumbing and to provide for single-control operation. This unit completely controls the hydraulic circuit. All valves are easily accessible for repairs. Lines that might burst under overload pressure are eliminated by substituting self-contained holes drilled into the unit. Optional equipment available includes either steam-cored or electrically heated platens, and a semi-automatic unit for pre-setting time cycles.

Circle Item 117 on postcard, page 245

Bliss Combination Clutch and Brake for New Presses

A combination air-operated friction clutch and spring-released brake was announced recently by the E. W. Bliss Co., Hastings, Mich. This Type M clutch and brake was designed for crankshaft mounting on new presses and can-making machinery and for replacement of old style clutches. It is a compact design, and requires only a single valve for operation



Self-contained hydraulic press made by Clifton Hydraulic Press Co.

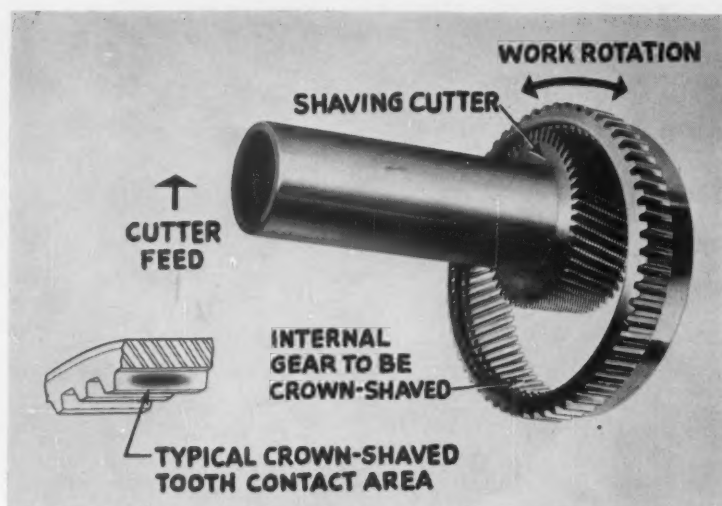


Fig. 1. Illustration showing how Red Ring plunge-cut rotary shaving process produces crown-shaved tooth forms on spur and helical internal gears

and control. Heating problems are said to have been practically eliminated in this model. Long-lasting, hard linings are provided to resist wear. These clutches and brakes are equipped with anti-friction roller bearings.

The new clutch is designed to simplify the modernization of old

presses by permitting existing flywheels and crankshafts to be used with a minimum of machining. These clutches and brakes have also been tested with good results on some types of high-speed can-making machinery, and for various clutch replacements.

Circle Item 118 on postcard, page 245

Equipment for Crown-Shaving Internal Gears

A Red Ring plunge-cut rotary shaving process for producing crown-shaved tooth surfaces in

internal spur or helical gears has been developed by the National Broach & Machine Co., Detroit,



Fig. 2. Internal gear-shaving machine set-up for crowning operation

Mich. Internal gears produced by Red Ring equipment designed for the new process are said to have the same inherent advantages of reduced noise level and increased wear life as external gears having the ellipsoid (crowned) tooth form previously developed by this company.

The new process, illustrated in Fig. 1, is particularly adaptable to internal gears employed in automatic transmissions and other types of geared drives operating under relatively high loads at high speeds where minute tooth errors or deflections under load present noise and wear problems. The Red Ring Model GCR internal gear-shaving machine, Fig. 2, equipped to handle this kind of work makes use of a specially developed rotary gear-shaving cutter and new plunge-cut infeed techniques.

An internal gear to be shaved, such as shown in Fig. 1, is mounted on the work-head of the internal gear-shaving machine. Then the cutter is meshed with the gear and hand fed against a stop to position the cutter in the correct axial location with the gear. The work-head is then rotated with the cutter in mesh with the work. The cutter is fed up to depth in predetermined increments with no cutter reciprocation. This plunge-cut infeed permits the cutter to form a crowned tooth surface while simultaneously finishing the gear tooth surfaces to provide uniformity and accuracy. The rotary shaving cutter is slightly wider than the gear teeth being shaved.

It is claimed that gears can be produced by this plunge-cut process, with or without the crowning feature, at speeds approximately twice as fast as can be obtained by conventional methods using cutter or work reciprocation. The tooth shape produced is like that of the ellipsoid tooth form. Usually the teeth are slightly thinner at the ends than at the center. The maximum tooth thickness zone can be centered or positioned at either side of the center, as desired, and the amount of crown can be varied. The crowning operation results in tooth thickness variations of only a few ten-thousandths of an inch of tooth-face width. The crowned tooth has the advantage of eliminating bearing pressures at the ends of the teeth caused by minute errors or gear deflections under load.

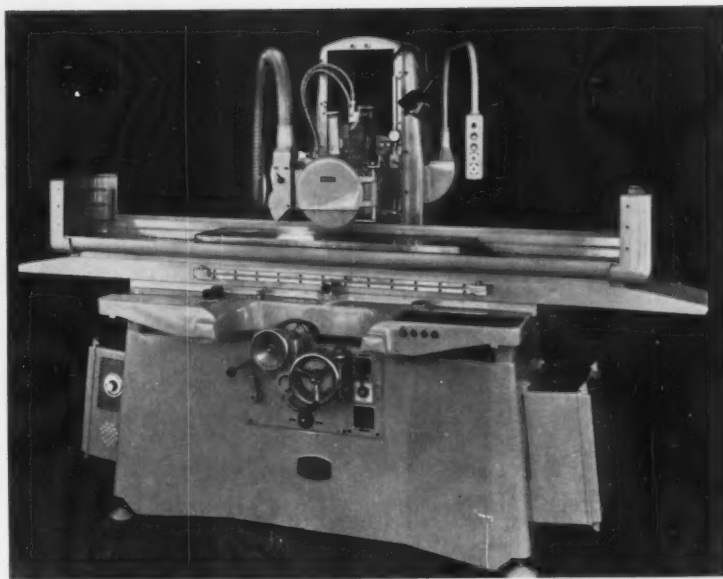
Circle Item 119 on postcard, page 245

Horizontal Precision Type Surface Grinder

A Blohm horizontal surface grinder is being introduced in this country by the Maserati Corporation of America, Westbury, N. Y. The design principle used in this new surface grinder is said to assure maximum precision and accuracy. For added precision plus operating smoothness and long life, the saddle and table are carried on ball-bearing assemblies operating on hardened, precision ground chromium-nickel-steel ways.

The 5-H.P. motor is mounted directly on the spindle which runs on adjustable tapered bronze bushings provided with pressure lubrication. Wheels up to 4 inches in width can be used in conjunction with a cross feed of up to $2\frac{1}{2}$ inches per stroke. These table and spindle features, combined with an unusually sturdy over-all construction, are said to practically eliminate vibration and help insure maximum concentricity. The Microtip in-feed and depth-feed controls of this machine are said to permit maximum accuracy of adjustment control. After a rough hand adjustment this control system gives push-button automatic adjustment to provide a cross feed of 0.0002 inch and a depth feed of 0.00004 inch.

Circle Item 120 on postcard, page 245



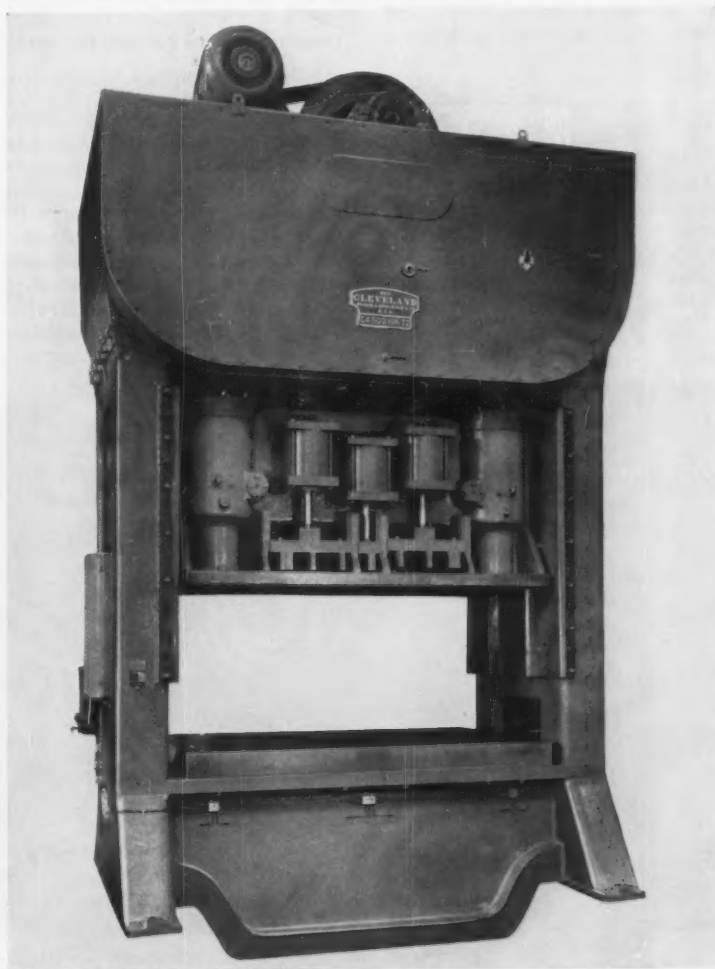
Blohm surface grinder introduced by the Maserati Corporation of America

Cleveland Four-Point Press

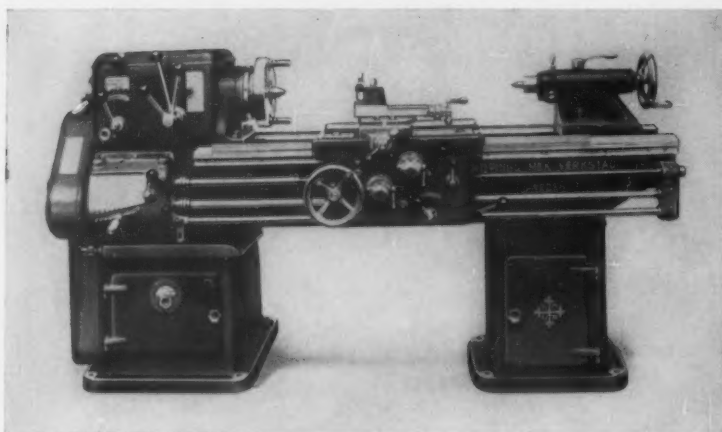
A four-point double-geared press equipped with a single-station electrically controlled drum type air-friction clutch and an air-operated bar knock-out has just been announced by the Cleveland Punch & Shear Works Co., Cleveland, Ohio. The slide of this press is provided with an air counterbalance and the flywheel is fitted with an auxiliary air brake to bring it to a quick stop.

The bed of this four-point press is equipped with one set of two air cushions and has a 10-inch stroke. The press has a capacity of 500 tons, a 20-inch stroke with 14-inch adjustment, and a shut height of 40 inches. The bed is 72 by 108 inches and has the same surface area as the face of the slide. The press is provided with a variable-speed motor which permits the slide to be operated at from 7 to 14 strokes per minute.

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Four-point press announced by the Cleveland Punch & Shear Works Co.



High-speed lathe being introduced in this country by Homestrand, Inc.

Koping Lathes and Milling Machines

Homestrand, Inc., Larchmont, N. Y., exclusive U. S. agent for Swedish-built Koping lathes and milling machines, is introducing in this country a Koping Model S8S lathe. This is an 8-inch high-speed

lathe combining rugged construction with precision control and is available with a wide variety of accessories and attachments designed to increase its versatility.

Circle Item 122 on postcard, page 245

Engine-Driven Welding Machine

A 200-ampere engine-driven welder, for pipeline welding and all types of construction and maintenance work, was announced recently by the Welding Department of the General Electric Co., Schenectady, N. Y. This welder, designated as the Type WD20AG, is NEMA-rated for a current range

of from 40 to 250 amperes and is said to handle all direct- or alternating-current electrodes from 1/16 to 1/4 inch in diameter with excellent welding characteristics.

The generator control consists of the tap switch and current rheostat, which provide for precise current settings and eliminate the

need for subsequent readjustment. There are six electrode taps—one for each different electrode size. The liquid-cooled Hercules engine operates at 1750 R.P.M. and has a 17-gallon fuel tank which holds sufficient gasoline to keep the generator running over thirteen hours at the full-load rating. The welding generator is direct-driven through a flexible metal-disc coupling.

All operating parts are protected by a full-length canopy made of 16-gage steel. The welder will fit crosswise in a standard pick-up truck and has a skid type base for easy portability.

Circle Item 123 on postcard, page 245

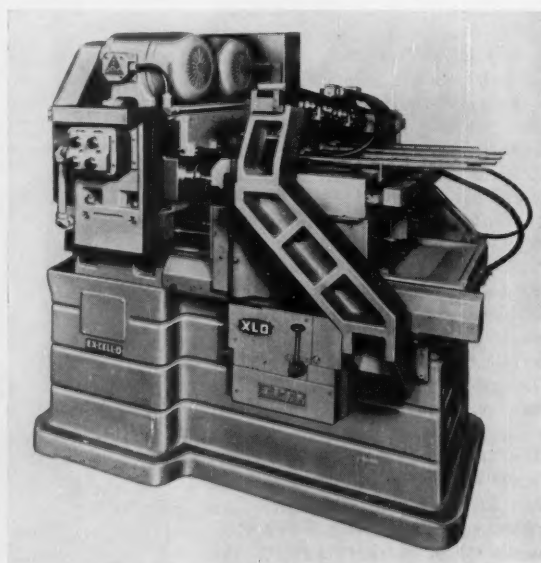
Ex-Cell-O High-Production Boring Machine

The Ex-Cell-O Corporation, Detroit, Mich., has brought out a Style 112-D precision boring machine equipped for finish-boring valve lifter bodies at the gross production rate of 1200 pieces per hour which will be in operation at the Machine Tool Show. This is a single-end hydraulically operated model with a completely new control panel. It will be shown with work-handling equipment designed to receive parts from a conveyor, direct the parts into loading chutes, insert them into chucks, and eject the finished pieces into another conveyor.

Work-pieces are of cast iron,



G-E engine-driven welder designed for pipeline, construction and maintenance work



High-production boring machine announced by the Ex-Cell-O Corporation



Fig. 1. Sheffield Plunjet Multichek gage for checking grooves in ammunition components

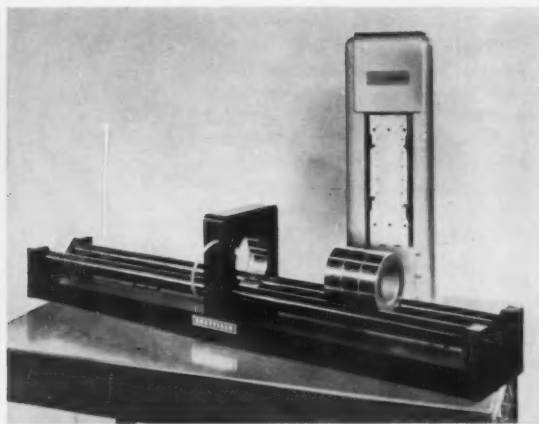


Fig. 2. Machine control unit used on centerless grinder to gage bourrelet diameter of shells

and the operation is finish-boring blind holes 9/16 inch in diameter and 1 inch deep. Four precision boring spindles carry the tools for completing four parts during each cycle. If one of the parts

comes to the machine with the hole at the wrong end the machine stops. Also, an interruption in the flow causes the machine to stop.

Circle Item 124 on postcard, page 245

Sheffield Gages for Ammunition Components

The Plunjet Multichek gage shown in Fig. 1 has been developed by the Sheffield Co., Dayton, Ohio, for checking seven grooves of an ammunition component by means of seven movable caliper gaging arms, one floating vertically, and all having interchangeable tungsten-carbide contacts. The part is presented to the gage on carbide rails. This typical,

simple Plunjet Multichek gage shows whether the dimensions are within or outside the allowable tolerance. The position of the floats in the seven-column Precisionaire indicates whether the part is acceptable or the amount it is out of tolerance.

Another recent development is the Sheffield Plunjet machine control unit shown in Fig. 2. This unit

is designed for mounting on a No. 3 Cincinnati centerless grinder for controlling the grinding of the bourrelet diameter of 105-mm. shells. Three matched Plunjets are mounted in the ring to gage the diameter of the shell as it passes from the grinder along the ways of the gage. The position of the floats in the two-column Precisionaire indicates whether the part is within tolerance or the amount it is out of tolerance.

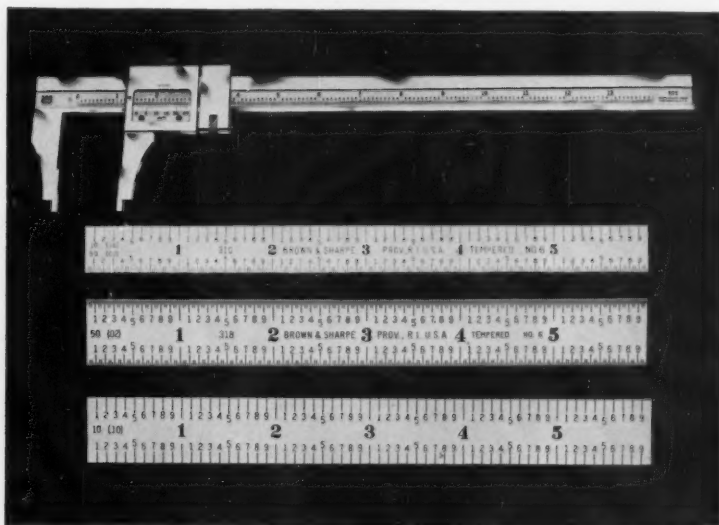
Circle Item 125 on postcard, page 245

Brown & Sharpe Vernier Calipers

The Brown & Sharpe Mfg. Co., Providence, R. I., has announced a new line of vernier calipers which have a sunken, dull chromium background extending along the center of the bar on which graduations and figures in jet black stand out clearly, making these tools exceptionally easy to read. Other surfaces of these vernier calipers are finished in bright chromium to reduce wear at the bearing surfaces and also to protect the tools from rusting.

The vernier plate of this caliper is made over twice as long as conventional vernier plates to facilitate reading and to make possible more accurate settings. Graduations are accurately machine cut. These vernier calipers are being offered in three sizes, 6, 12 and 24 inches in length. They are made in two styles, No. 571 in chromium finish with English measure and No. 574 in chromium finish with English and metric scales.

Steel rules with chromium finish and decimal graduations have also



Vernier caliper and rules with chromium finish, brought out by the Brown & Sharpe Mfg. Co.

been announced by the Brown & Sharpe Mfg. Co. The new No. 310 chromium-finish flexible steel rule and No. 318 chromium-finish tempered steel rule in 6-inch lengths, have decimal graduations. These rules with 0.10-inch and 0.02-inch graduations make it possible to transfer measurements in decimal parts of an inch without any computations. Jet-black figures and graduations on the dull chromium finish make the rules especially easy to read.

Circle Item 126 on postcard, page 245

Baird Tumbling Machine

A Model H tumbling machine of the oblique tilting type has been introduced by the Baird Machine Co., Stratford, Conn. This machine incorporates design and operating features developed to provide greater safety and convenience for the operator. There are few moving parts and all controls and adjustments are conveniently located.

The bottle barrels are easily emptied by the manual-hydraulic or power tilting equipment. The motor serves to counterbalance the load. Barrels of different shapes and made from various materials may be mounted on the machine to suit individual requirements.

Circle Item 127 on postcard, page 245



(Above) Tumbling barrel introduced by Baird Machine Co.



Mechanical tool-holder announced by Newcomer Products, Inc.

"Nu-Tool" Mechanical Tool-Holder

The Newcomer Products, Inc., Latrobe, Pa., has announced the production of a mechanical tool-holder for use with its "Throway" carbide inserts. This new holder, called "Nu-Tool," is designed to speed production, eliminate grinding, and simplify tool inventories. It consists of only three parts—a one-piece alloy-steel holder heat-treated to give a hardness reading of 40-45 Rockwell C, a top clamp that indexes against a solid stop, and a top clamp screw.

The most important feature of this tool-holder is the solid, hardened and precision ground tip-seating surface that provides proper support for the inserts. This surface eliminates the need for shims under the insert. Also important are the indexing stops for the insert and clamp. All stops

are solid projections of the alloy-steel holder.

Standard sizes available range from 3/4 inch square to 1 inch by 1 1/4 inches in triangular Styles TA, TB, and TF. Special sizes from 1/2 inch square to 1 1/4 inches square are also available in the styles noted. Mechanical carbide chip-breakers are included with this tool-holder.

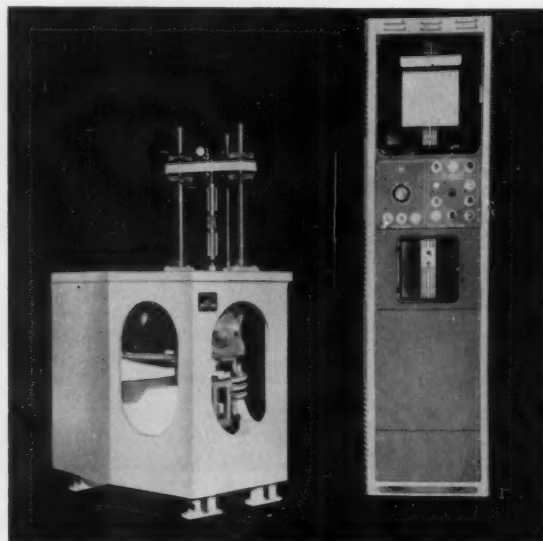
Circle Item 128 on postcard, page 245

Ivy Dynamic Creep-Testing Machine

The dynamic testing of metals for creep and fatigue at ambient and elevated temperatures can be accomplished on an economically priced Model BJL-1 dynamic creep-testing machine brought out by the Ivy Co., Norwalk, Conn. This machine is a commercial adaptation of equipment originally designed for and successfully applied to development work in the fabrication of aircraft components. It is of compact design, easy to set up, and gives a high degree of accuracy.

A static force of 0 to 5000 pounds in tension and an alternating force of 0 to plus-and-minus 4000 pounds at 3600 cycles per minute, with a maximum amplitude of 0.050 inch, may be applied with this machine. A creep up to 0.375 inch can be accommodated.

(Below) Dynamic creep-testing machine and control cabinet introduced by the Ivy Co.



A separate cabinet houses all controls and controllers for the basic machine and the high-temperature unit, and also accommodates the required instrumentation for temperature and creep recording.

Circle Item 129 on postcard, page 245

General Electric Circuit-Breaker

A two-pole common trip circuit-breaker, for use in panelboards and load centers, has been announced by the Trumbull Components Department, General Electric Co., Plainville, Conn. The new 2-inch breaker, designated Type TQL, consists of two-pole units with an interlocking trip mechanism assembled as a single unit and which will fit load centers or panelboards designed to take 1-inch Type R or Type TQL circuit-breakers.

The two-pole Type TQL unit is manufactured in six ratings from 10 to 50 amperes for 120/240-volt alternating-current operation. It has an interrupting rating of 5000 amperes alternating current. This unit is specifically designed to provide adequate protection for equipment and personnel wherever two-pole common trip circuit-breakers are required. Excessive current in either pole of the breaker trips both poles simultaneously, thus greatly reducing the risk of accidental shock. Thermal and independent magnetic trip elements provide protection against both short circuits



Circuit-breaker which is of two-pole common trip type

and sustained harmful overloads. Momentary overloads, such as those caused by motor starting, will not trip the breaker. The breaker is trip-free—that is, it will trip out even if the handle is held in against a circuit fault.

Circle Item 130 on postcard, page 245

"C-Omatic" Automatic Welding Equipment

An automatic welding process known as "C-Omatic," which uses low-cost carbon dioxide gas for shielding the arc while welding mild and medium-carbon steel, has been developed by the A. O. Smith Corporation, Milwaukee, Wis. This process is also said to offer the ad-

vantages of a visible arc which enables the welder to properly locate the arc in the welding groove and to observe the weld metal being deposited.

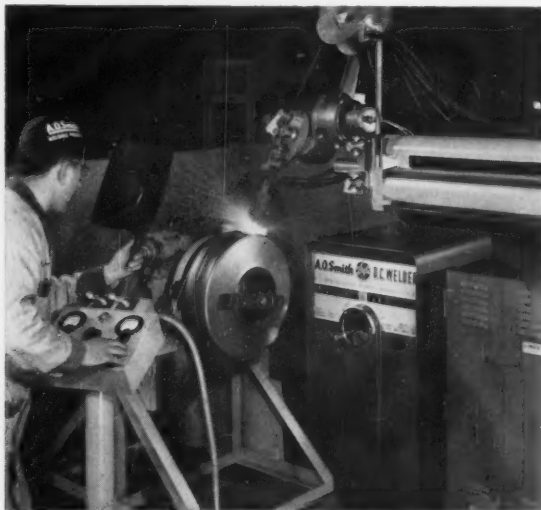
Welds made with carbon dioxide gas have a wide and well-rounded bead penetration. It is claimed that the shape of this bead penetration offers an advantage in some applications, such as in the case of a V-groove joint. The round bead penetration insures complete fusion and is said to provide better liberation of gases from the molten puddle.

The "C-Omatic" welding head is a simple, rugged unit with a motor drive that provides wire-feeding speeds of from 6 to 600 inches per minute. This permits application to submerged arc welding by substituting the proper welding nozzle and making a few minor electrical connections. The head can be easily adjusted for welding in any position. The control system is of the electrical-mechanical type constructed for easy servicing and low maintenance cost.

Circle Item 131 on postcard, page 245

Cy-Co-Trol Tool-Control Units

Royal Design & Mfg., Inc., Detroit, Mich., has brought out "Cy-Co-Trol" tool-control units designed to reduce costs in automotive and many other types of high-production metal-working



"C-Omatic" automatic gas-shielded arc-welding equipment developed by A. O. Smith Corporation



"Cy-Co-Trol" unit developed for efficient tool servicing of metal-working machines

plants. These control units have standard and special gages mounted on the face of the tool-control board for the complete set of tools used on the machine. Sharpened tools from the grinding room are pre-set in a gage before they are stored on this board.

A cyclemeter controls the tool life and operates automatically with the machine. It contains an accurate solenoid-actuated counter with an adjustable stop-lever. The control unit counts the number of machine cycles, and locks out the cycle control of the machine when it reaches zero. Colored lights actuated by the cyclemeter also aid the operator.

A yellow light shines when a tool reaches either the final 10 per cent of its estimated life, or its last hour of useful life. A red light goes on when the indexing pointer reaches zero. At this time, tools must be changed and the cyclemeter re-set before the machine will recycle.

Data plates, mounted on the panel board, quickly identify the tools stored for each station. This plate also gives the operator information on the spindle and tools to enable him to maintain maximum production and operating efficiency.

Circle Item 132 on postcard, page 245

Electronic Microcomparator Developed for Use in Checking Gage-Blocks

The Cleveland Instrument Co., Cleveland, Ohio, has brought out an opposed-head "Micro-Ac" electronic microcomparator, for

checking gage-blocks to millionths or half-millionths of an inch, with consistent repeat readings within one quarter-millionth inch. This instrument includes two Micro-Ac gage heads, mounted on the column of a stand above and below a work-table as shown in the illustration.

With this arrangement the upper gage head contacts the work in the usual way, while the lower gage head is inverted and has its tip extending through a hole in the table to contact the under side of the work. Thus, the two gage heads provide direct caliper-ing of the work. This design eliminates any need for "wringing" the work to an anvil, and has been developed to assure a true size measurement.

The gage heads are connected to an amplifier, which has a meter that shows the deviation of the work from nominal size. Two sensitivities are provided which are used interchangeably at will, with readings of 0.000010 to 0.000001 inch or 0.000001 to 0.0000005 inch per scale division. The corresponding full-scale readings are 0.0002 to 0.000020 inch and 0.000020 to 0.000010 inch each side of zero. Other ranges and sensitivities can be provided for the less-sensitive scale.

This instrument accommodates work of any thickness up to 8 inches. To facilitate placing the parts between the gage heads, two push knobs at the front of the base operate through cables to retract the contact tips about 0.003 inch

Circle Item 133 on postcard, page 245

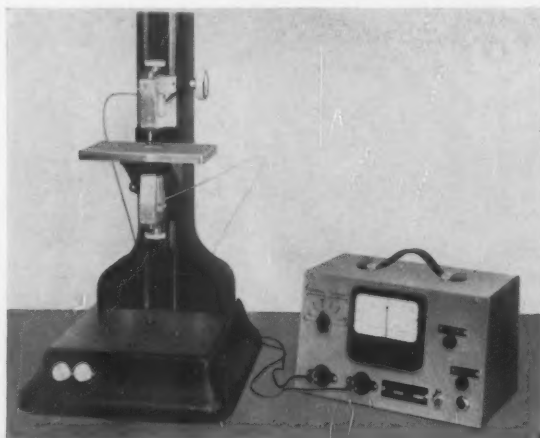
Landis "Little Lansta" Die-Head

The Landis Machine Co., Waynesboro, Pa., has brought out a "Little Lansta" stationary die-head for maintenance work. This die-head can be applied to the 2-inch "Little Landis" pipe threading and cutting machine. It is furnished in two sizes, the 3/4-inch head with a 1/8- to 3/4-inch pipe range and the 2-inch head with a 1- to 2-inch pipe range. This head has been developed primarily to replace the die-head previously furnished with the "Little Landis" machine. It is of more rigid construction, however, and incorporates an improved mechanism to assure positive locking. The chaser length has also been increased by one-third through the use of Lanrac tangential chasers having a length of 2 1/4 inches. This results in an increase in chaser life as these chasers can be reground for 80 per cent of their original length.

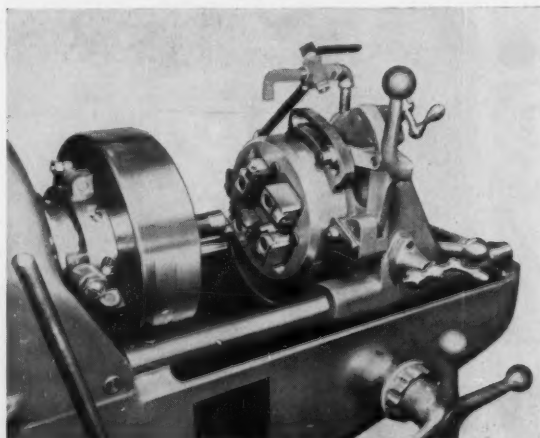
The entire range of pipe sizes handled by the 2-inch head can be threaded by making only size adjustments. Likewise, when the 3/4-inch head is set up to thread 3/4-inch pipe only a diametrical change of the die-head is needed to thread 1/2-inch pipe. A size adjustment can be made quickly.

No chaser holder changes are necessary for either head when threading pipe. These holders can be used for either tapered or straight pipe threading. Bolt threading is possible through the use of bolt-chaser holders.

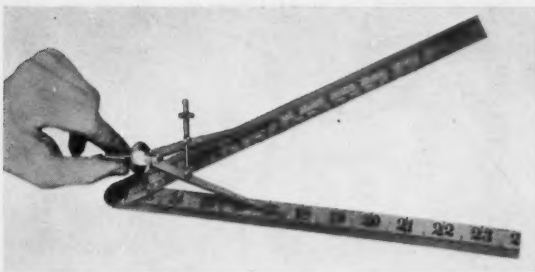
Circle Item 134 on postcard, page 245



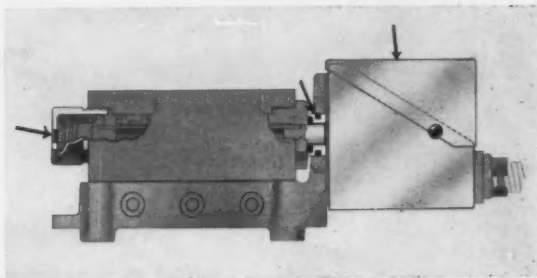
"Micro-Ac" electronic microcomparator brought out by Cleveland Instrument Co.



"Little Lansta" die-head for use on pipe threading and cutting machine



Stainless-steel rule with protractor feature introduced by the George Scherr Co., Inc.



Solenoid valve of dust-tight construction made by C. B. Hunt & Son, Inc.

Jointed Stainless-Steel Rule with Protractor Feature

A jointed stainless-steel two-foot rule, which serves as a protractor as well as a measuring rule, has been introduced by the George Scherr Co., Inc., New York City. This tool is designed to provide a practical means for making linear and angular measurements.

The jointed rule has an accurate scale of chords engraved on one side for use in measuring angles in increments of $1/2$ degree from 0 to 120 degrees. It is also provided with two center dots, one on each blade, by which a pair of ordinary dividers can be used to set the rule to any desired angle. This arrangement can also be used to measure any angle.

The stainless-steel rule has graduations reading in $1/8$, $1/16$, $1/32$ and $1/64$ inch. The joint is provided with a spring tension which supplies sufficient friction to hold the angle setting when doing scribing and lay-out work.

Circle item 135 on postcard, page 245

Hunt "Quick-As-Wink" Solenoid Valves

C. B. Hunt & Son, Inc., Salem, Ohio, have announced improvements in the inexpensive "O" type solenoid valves that are said to effectively protect all operating parts of this "Quick-As-Wink" line of valves from the entrance of dust and grit. A sintered-bronze filter consisting of small bronze particles pressed together into a porous mass is located in the breather hole. This filter permits air to pass through in either direction, but prevents the entrance of dust or grit which might interfere with the proper action of the return spring or work into the valve parts.

A sleeve, sealed with rings at two places, prevents dust or other foreign material from entering the area where the solenoid armature contacts the valve plunger, thus assuring dust-free operation at this point. The top half of the two-piece cover for the solenoid overlaps and fits tightly over the bottom half of

the cover protecting the solenoid from dust, oil, grit, and foreign particles. The upper half of the cover can be removed by simply loosening two screws. This provides easy access to the interior of the bottom half of the cover for connecting the solenoid leads to the control wiring. These design and construction changes will be furnished as standard on all sizes of the company's line of "O" type solenoid valves.

Circle Item 136 on postcard, page 245

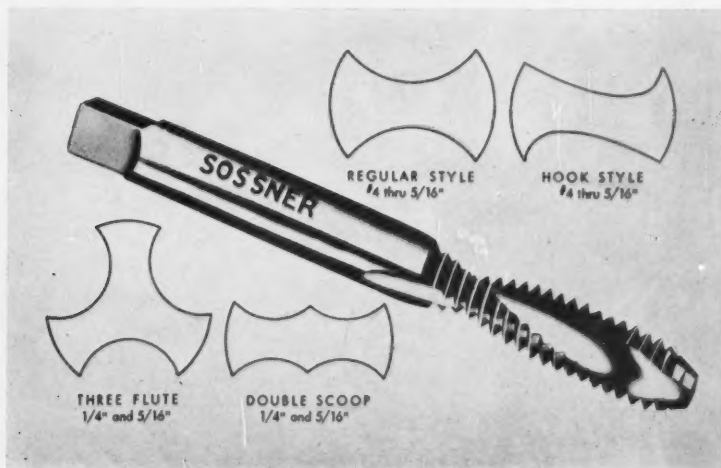
Sossner Spiral-Fluted Taps

The Sossner Tap & Tool Corporation, Lynbrook, Long Island, N. Y., has announced recent additions to their line of spiral-fluted taps which make possible a broader range of application for this style of tap and eliminate some of the problems previously encountered in their use. In the machine-screw sizes and in the $1/4$ -inch and $5/16$ -inch fractional sizes two distinctive styles of two-flute type spiral-fluted taps are available. The "regular style" (see illustration) is for general-purpose work on non-ferrous materials and the "hook style" is for use where freer cutting action is desirable.

Three-flute spirals in $1/4$ -inch and $5/16$ -inch fractional sizes are available for tapping ferrous materials, where extra strength is desired. A unique "double scoop" design is offered in $1/4$ -inch and $5/16$ -inch sizes. From the illustration it can be seen that this unique style affords extremely free cutting action due to a combination of narrow land, wide flute, hooked cutting face and chip-breaker effect. This style is said to have given outstanding results in difficult applications such as deep blind-hole tapping.

Circle Item 137 on postcard, page 245

(This section continued on page 222)



Spiral-fluted tap made by Sossner Tap & Tool Corporation

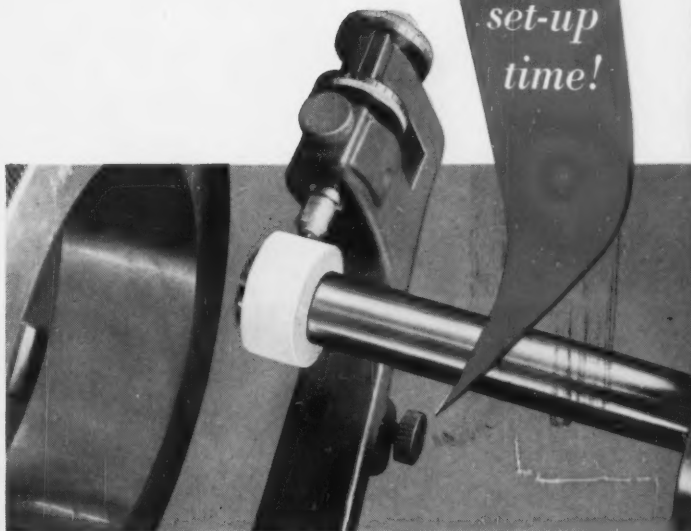
The Most Efficient




Universal Grinders

New Brown & Sharpe Universal Grinding Machines are making new operating economy possible for internal and external grinding. For example, an exclusive Set-Diamond wheel truing attachment cuts dressing time on average internal jobs as much as 60%! It's an "optional" you'll want. Other outstanding exclusive features provide: instant combination of separate manual operations into full automatic cycles . . . external or internal grinding instantly available in any position . . . multiple-taper grinding at one set-up . . . and super-accuracy performance that makes sizing to 0.0001" routine! A unique combination of flexibility and accuracy — the perfect "bridge" between conventional universals and single-purpose machines. Four machine sizes — all available with **ELECTRALIGN**. Write for full details: Brown & Sharpe Mfg. Co., Providence 1, R. I.

...save
up to
60%
on
set-up
time!



Exclusive Time-Saver. Set-Diamond internal wheel truing attachment (optional) requires only one set-up at start of job. Stays on machine. Swings out of way during grinding — swings back for subsequent dressings. Only one wheel position for sizing complete job.

Brown & Sharpe 

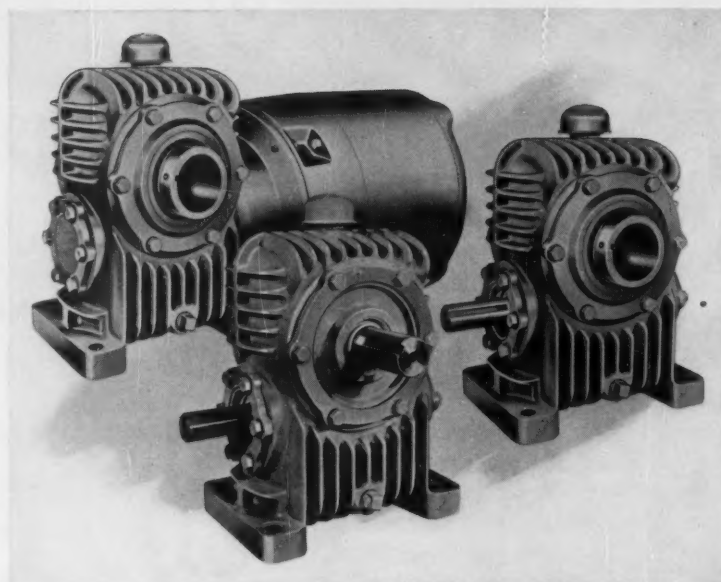
BUY THROUGH OUR PAY-AS-YOU-DEPRECIATE MACHINE TOOL PLAN



Worm-Gear Speed Reducers in Extended-Shaft and Motorized Models

A versatile speed reducer in extended-shaft, shaft-mounted and motorized models has been added to the line of double-enveloping worm-gear speed reducers manufactured by Cone-Drive Gears Division, Michigan Tool Co., Detroit, Mich. The new model has a maximum capacity of 13 H.P. and is available as a standard extended-shaft unit, shaft-mounted unit, or either of these in a motorized type. All models are available with the worm in the over or under position, or with the gear-shaft vertical. Timken taper roller bearings are used throughout. The double-enveloping worm-gear reduces the distance between the shaft centers to about two-thirds that of conventional worm-gear reducers of equal capacity.

All models of this 3 1/2-inch center-distance cone-drive reducer are available in ratios from 5 to 1 up to 60 to 1. Additional output speed reductions can be obtained through the use of V-belts and sheaves. Shaft-mounted motorized models can carry the driven shaft and its load in many applications, thus eliminating pillow blocks and other bearings. The foot-mounting arrangement does away with belts, pulleys, bed plates, torque arms, and other con-



Worm-gear speed reducers in extended-shaft and motorized models made by Cone-Drive Gears Division, Michigan Tool Co.

ventional mounting arrangements for shaft-mounted reducers.

Circle Item 138 on postcard, page 245

DoAll High-Speed Steel Saw Bands in Claw-Tooth Design

A saw band combining the characteristics of high-speed steel with positive rake teeth designed to give maximum penetrating abil-

ity, cutting speed and tool life, has been brought out by the DoAll Co., Des Plaines, Ill. Faster cutting rates are obtained with this new "Demon" saw blade with less effort, the "hooked" teeth penetrating easily and virtually pulling themselves through the work. Since they penetrate and take a chip more easily there is less tendency to scuff and wear especially at the beginning of a cut.



Fig. 1. DoAll contour-matic sawing machine equipped with new Demon high-speed steel saw blade for accurate slotting of heavy steel parts

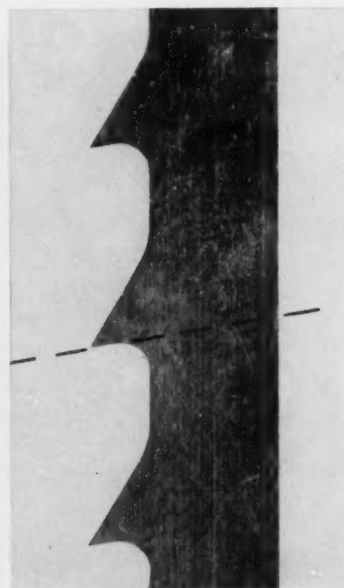
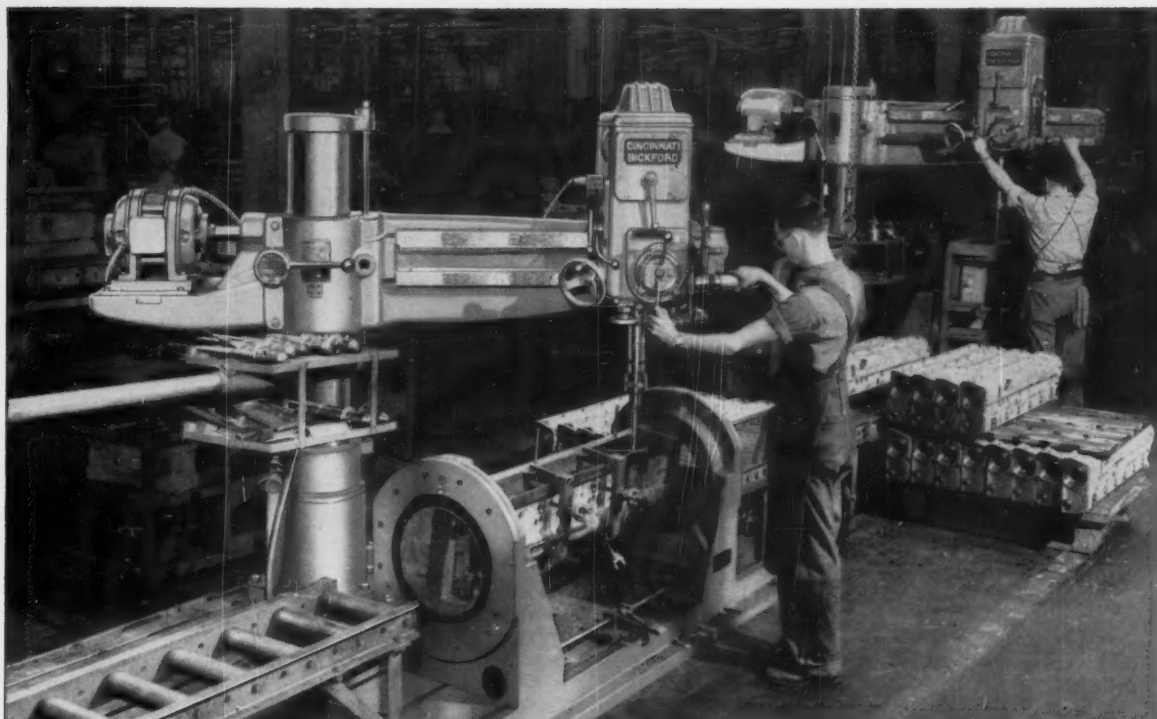


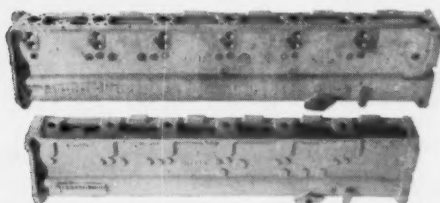
Fig. 2. Enlarged view of claw teeth of Demon saw blade.



**3 years of operation
with NO MAJOR
MAINTENANCE...**



Photos courtesy Caterpillar Tractor Co., Peoria, Illinois.



Camshaft Housings for new Caterpillar DW21 Wheel-type Tractor illustrated in insert picture, showing casting before and after drilling operations.

The performance of Cincinnati Bickford Super Service Radial Drills at Caterpillar Tractor Co. has been outstanding, steady and trouble free.

On this job, including drilling, tapping and reaming, 116 holes are produced, 14 are reamed within .0005" tolerance. Caterpillar Tractor Co. also states Cincinnati Bickford Super Service Radial Drills have contributed to the advancement of their product.

Write for Catalog R-21-C.



BOOTH 901

80 YEARS OF SERVICE

**CINCINNATI
BICKFORD**



RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

For more information on products advertised, use Inquiry Card, page 245

MACHINERY, August, 1955—223

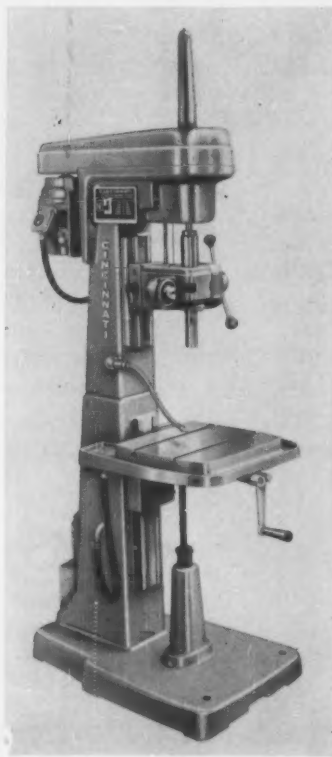
The metallurgical characteristics of this Demon saw band permit it to flex over the carrier wheels of a band machine at high speed and at the same time retain its high tooth hardness at temperatures up to 1050 degrees F.

Demon high-speed steel claw bands are now being offered in four widths from 1/4 inch through 1 inch and in four pitches (teeth per inch). In the 1 inch width all four pitches (2, 3, 4 and 6 teeth per inch) have been made available. New sizes have been added also to the Demon high-speed steel precision style blade which is now available in pitches of 4, 6, 8, and 10 and in five widths from 1/4 inch to 1 inch.

Circle Item 139 on postcard, page 245

Cincinnati Bench and Floor Type Drilling Machines

Sixteen-inch sliding-head bench, floor and multiple-spindle drilling machines have just been announced by Cincinnati Lathe & Tool Co., Cincinnati, Ohio. Important elements of these machines



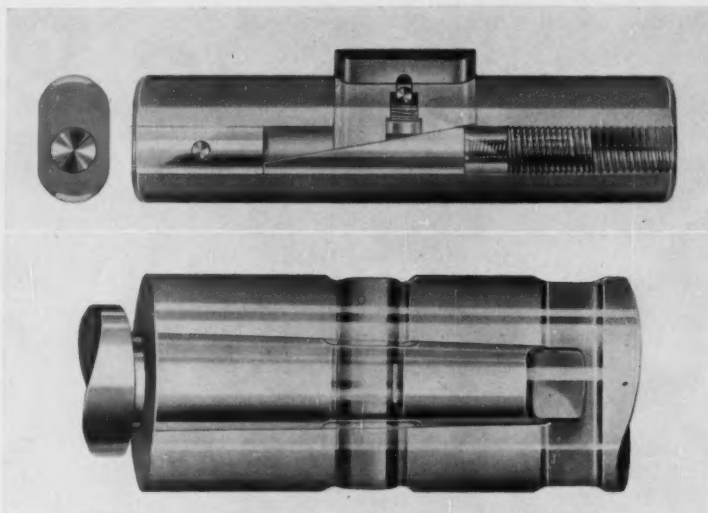
Sliding-head box-column drilling machine announced by the Cincinnati Lathe & Tool Co.

are built in and conveniently located for operator comfort as well as pleasing appearance. They are furnished complete with motor and controls to overcome installation delays and are ready to operate as soon as power leads are connected.

For easier drilling and higher production, the machines can be ordered with geared power feed. A simple selector is used to obtain any of four rates of feed which are engaged through a positive-jaw clutch.

A new direct-reading depth dial with positive stop is provided. When the drill is equipped with power feed, the dial may be set to disengage the feed automatically. The spindle is full-floating, being mounted in precision, sealed, lifetime-lubricated ball bearings. A simple V-belt drive transmits motor power directly to the spindle. A unique tilting motor bracket is provided to facilitate changing spindle speeds. No wrenches are required and both hands are free to shift the V-belt to the proper groove. A full, contour-fitting belt guard is standard equipment. These machines have a rated capacity for drilling 1-inch holes in cast iron when equipped with the regular 1-H.P. motor which operates at a speed of 1800 R.P.M. A No. 2 Morse taper spindle is standard and a No. 3 Morse taper spindle is optional. These drilling machines will be on display in Booth 309 at the Machine Tool Show.

Circle Item 140 on postcard, page 245



(Upper) Phantom assembly view of Davis adjustable draw-key.
(Lower) Phantom view illustrating application of draw-key

Draw-Key for Locking Morse Taper-Shank Tools

An adjustable draw-key for locking Morse taper-shank tools quickly and securely in machine spindles is announced by the Davis Boring Tool Division of Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. This draw-key arrangement consists of three rugged moving parts—expanding wedge, plunger, and adjusting nut.

The adjustable draw-key locks the tool shank positively in the machine spindle with one, easily applied wrench adjustment. It is available in a complete range of sizes to fit virtually all machines with spindle diameters from 3 through 8 inches, and draw-key slots from 33/64 inch by 1 1/8 through 11/16 inch by 1 3/8 inches. A wide range of wedge adjustment in the draw-key design accommodates variations in shank and spindle slot location. Thus, the large assortment of solid keys normally required is eliminated, together with any possibility of marring the spindle or tool shank by hammering-in old-fashioned keys.

An outstanding advantage of the Davis adjustable draw-key is the complete absence of any exterior attachments to the machine spindle. When in place, this key is entirely inside the spindle slot, and within the spindle's outside diameter.

Circle Item 141 on postcard, page 245

(This section continued on page 230)

ANOTHER EXAMPLE of
REDUCING COSTS WITH—

Buhr

ECONOMATION



Mills, core-drills, drills,
countersinks and individual-
lead-screw taps 206 intake
manifolds an hour gross!

Economy and automation are combined in this Special to form another example of the way Buhr *Economation* reduces production costs for leading manufacturers.

This 6-way dial-type hydraulic-feed Buhr Special is equipped with a 72"-diameter 8-position automatic index table, complete with

shot bolt.

Chip disposal is accomplished by an automatic rotating chip conveyor, attached to index.

Operations formerly accomplished by eight machines were combined in this Buhr Special—and volume of production was increased!... A typical example of Buhr *Economation*!

Buhr

MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

See what Buhr *Economation* can do to reduce your production costs. A phone call, wire or letter will bring you a prompt consultation with one of our top sales executives.

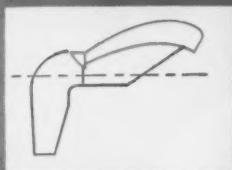
BUHR MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

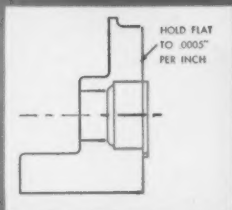
Solidly Engineered • Precision Built • for World's Leading Manufacturers

Setup and Tooling Costs

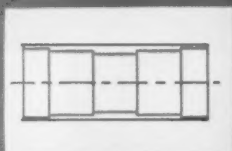
ON THE HOUSE



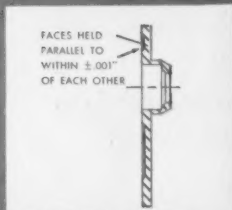
Part—Anvil. Material—cast iron. Operation—turn elliptical contour of 220°, 15° angle on face and short O.D. on opposite end. Comment—could not be turned economically; prior to use of Air-Gage Tracer.



Part—Gear housing. Material—aluminum casting. Operations—turn, face and bore. Total machine time—3 minutes.



Part—Motor shell. Material—seamless steel tubing. Operations—face and bore both ends. Floor to floor time per piece—13½ minutes.



Part—Housing cover. Material—aluminum forging. Operations—turn, face both sides and bore. Floor to floor time per piece—4½ minutes. Previous production—7 pieces per hour.

How One Leading Contract Shop Affords It

What's the secret of absorbing these costs—with competitive bidding and profit margins as they are in the contract shop field today?

"Simple," says C. C. Gregson, President, Illinois Gage and Manufacturing Company of Franklin Park, Ill., leading supplier of highly specialized machining of aluminum and magnesium castings. "We are able to produce a better job faster and hold close tolerances more economically than shops *provided with conventional equipment*. Setup and tooling is so minor that in most instances

the customer is not even charged for it."

Note that phrase "conventional equipment"—it's the pay-off! The one 16" and the two 13" Monarch lathes you see pictured below are all Monarch Air-Gage Tracer equipped. So is the 10" Monarch that isn't in the picture. There's your difference!

To quote again, "we have found they speed up production anywhere from 10% to 90%." Air-Gage Tracers in your plant would likely enable you to realize similar savings. Why not investigate? . . . **The Monarch Machine Tool Co., Sidney, Ohio.**



Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A GOOD TURN FASTER
... TURN TO MONARCH

AMERICAN STANDARD KNURLING—3

Dimensioning

Uniform drafting practice is important. Essential dimensioning to be complete should include width; outside diameter both before and after knurling, with the selected tolerance; and the diametral pitch. The style of knurling should also be specified on the drawing, as illustrated in Fig. 3.

Dimensions for cylindrical knurls, indicated in the diagrams in Fig. 4, can be determined by employing the formulas given below.

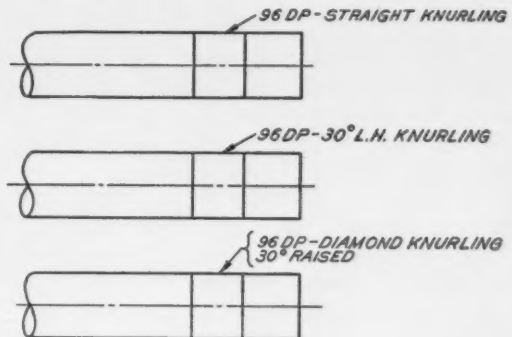


Fig. 3. Styles of knurling

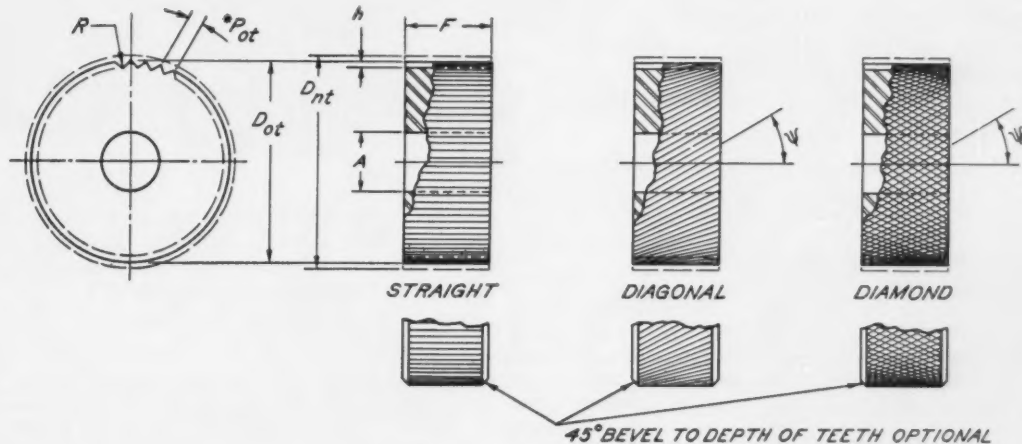


Fig. 4. Typical cylindrical knurls

A = diameter of hole

P = diametral pitch = $\frac{N_t}{D_{nt}}$

D_{nt} = nominal diameter of cylindrical knurl
= $\frac{N_t}{P}$

N_t = number of teeth on cylindrical knurl
= $P \times D_{nt}$

P_{nt}^* = circular pitch on nominal diameter
= $\frac{\pi}{P}$

P_{ot}^* = circular pitch on major diameter
= $\frac{\pi D_{ot}}{N_t}$

D_{ot} = major diameter of cylindrical knurl
= $D_{nt} - \frac{N_t Q}{\pi}$

ψ^\dagger = helix angle of knurl (30 degrees preferred)

Q = tracking correction factor applied to circular pitch based on nominal diameter
= $P_{nt} - P_{ot}$

h = tooth depth

F = face width

R = radius at root

For diagonal knurls, P_{nt} and P_{ot} cover transverse circular pitch which is measured in the plane perpendicular to the axis of rotation.

† Helix angle on cylindrical knurl may be right hand or left hand. Left-hand helix angle shown on knurl produces right-hand helix on work.

Extracted from ASA B5.30-1953 with permission of publisher, American Society of Mechanical Engineers

MACHINERY'S DATA SHEET

AMERICAN STANDARD KNURLING—4

The Tracking Correction Factor Q

Use of the preferred pitches for cylindrical knurls, Table 1,* results in good tracking on all fractional work blank diameters which are multiples of 1/64 or 1/32 inch, depending on the pitch selected.

To accomplish this, the work surface must be evenly marked during the first revolution of the work, which requires pitch circles to roll without relative slippage. Therefore, extent of penetration of the work by the knurl during the first revolution must be considered.

Because of the many variables involved in knurling practice—cam contours, hardness of material, and elasticity of machine tools and tool-holders—the method of determining the required correction is necessarily empirical.

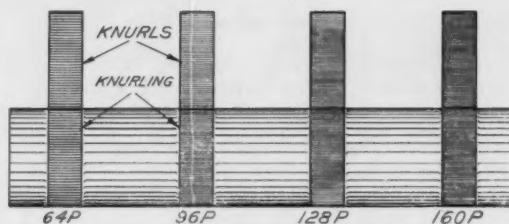


Fig. 5. Illustrations of standard pitch knurls and knurling

Accordingly, the tracking correction factor Q , Table 4,* has been incorporated in knurl specifications on the basis of experimental work and experience. Good tracking for general knurling conditions has resulted from this practice.

* To be published in coming number of MACHINERY.

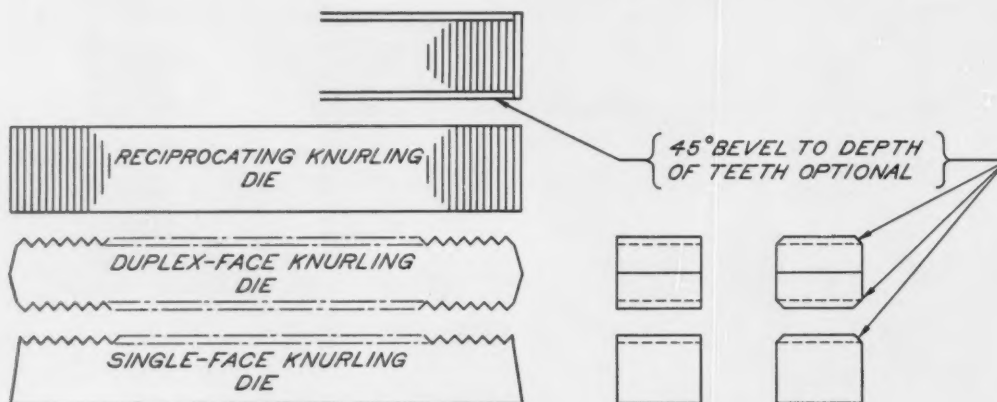


Fig. 6. Typical flat reciprocating knurling dies—straight teeth

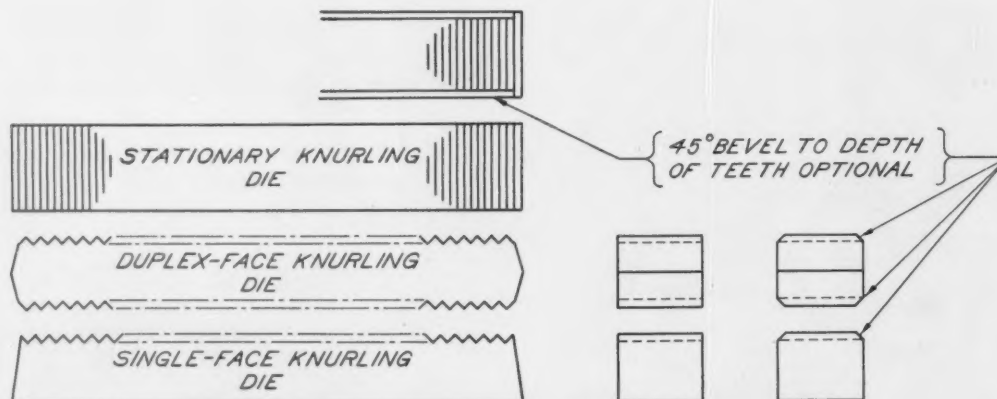
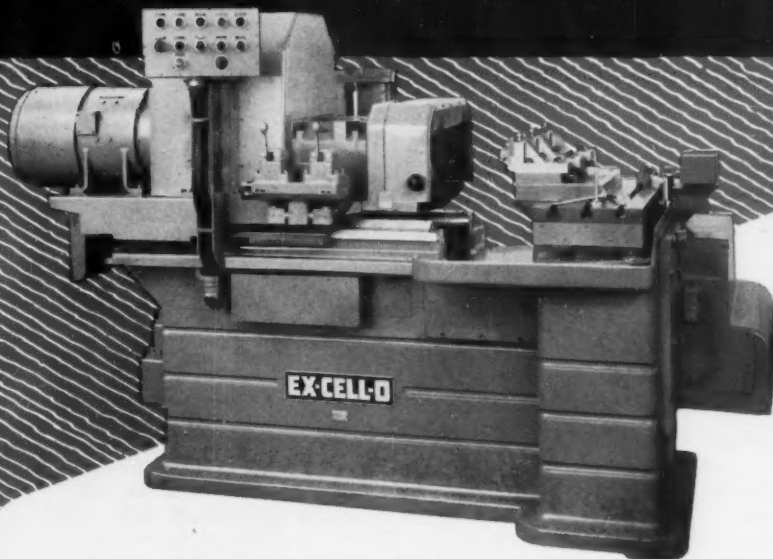


Fig. 7. Typical flat stationary knurling dies—straight teeth

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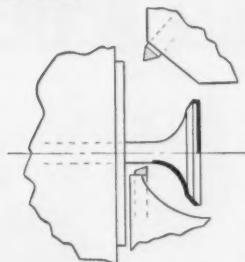
NEW EX-CELL-O MACHINE

contours valves by direct cam action (no levers)

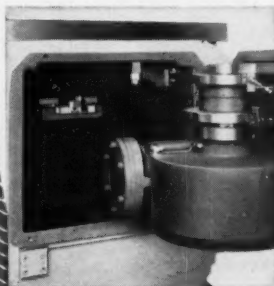
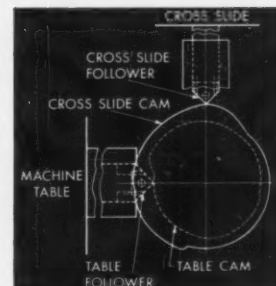


NEW EX-CELL-O CAM BORING MACHINE, Style 312, equipped with two spindles and tooling for operations on valve heads.

VALVES ARE CONTOURED, faced, turned, and taper-turned. This drawing shows the two tools used in each station. The paths they follow on the workpiece are indicated in heavy lines.



CONTOURING ACTION: Cams act directly on the slide—**NO LEVERS**. Separate cams for table and for cross slide are both on one shaft, giving exact co-ordination.



CAMS CHANGED IN MINUTES: Cam assembly swings out for quick change of operation. All motors are outside the base.



CHIPS, COOLANT CANNOT ENTER THE BASE. Large chip chute is cast integral with the solid top of the heavy nickel iron base.



55-1

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS
AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Westinghouse Generator Type Welders

A line of gasoline-engine-driven generator type welders has just been announced by the Westinghouse Electric Corporation, Pittsburgh, Pa. Welders in this line are available in current capacities ranging from 30 to 350 amperes alternating or direct current. The new welders are compact, completely self-powered and may be supplied with optional running gear equipment to meet customer's requirements.

One direct-current model is a dual-purpose unit which not only handles all types of direct-current welding but can also be converted into an alternating-current power plant by a conversion switch. The alternating-current model also has a 110-volt direct-current outlet for operating universal drills and lights. Another model is equipped for high-frequency operation so that it can be used for Heliarc inert-gas welding. All the models have stepless current adjustment.

The Onan Model CW gasoline engine is a four-cylinder, 20-H.P. air-cooled type. It has electric starting and an internal fly-ball governor with a variable-speed control attachment.

Circle Item 142 on postcard, page 245



Gasoline-engine-driven welder brought out by the Westinghouse Electric Corporation

Versatile Hardness Tester For Shop and Laboratory

Availability of the Mark VI Penetrator metal hardness tester is announced by the Tinius Olsen Testing Machine Co., Willow Grove, Pa. This is a versatile production tool which is said to employ an accurate method of hardness testing. It is used for testing ferrous as well as non-ferrous metal parts in a wide range of sizes, shapes, and contours. A variety of clamping means including chain, magnetic, and "C" clamps make it possible to test specimens ranging from metal strips only 0.002 inch thick to cylinders over eight feet in diameter.

The Penetrator is light, compact, and easily transported. It can be fastened directly to parts of any size in the laboratory or on the assembly line. In operation, a minute 136-degree pyramidal diamond—Vickers system—is pressed into the metal by an accurately controlled load of up to 40 kilograms. A powerful calibrated microscope measures the tiny indentation with an accuracy of one micron—about 40 millionths of an inch. Ball type indenters one and two mm. in diameter are available for testing cast iron and other materials.

Circle Item 143 on postcard, page 245

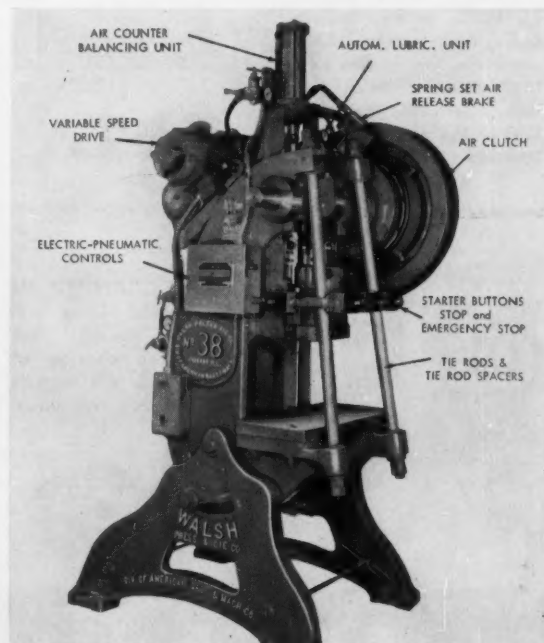
Walsh Open-Back Inclinable Presses

"Air-Clutch Hi-Flex" presses of the open-back inclinable type have been added to the line manufactured by the Walsh Press & Die Co., Chicago, Ill. These presses are equipped with electric-pneumatic controls that can be set for inclining, single-stroke or continuous operation at high or low speed with the possibility of stopping the press at any position of the slide. Variable-speed drives also make it possible to select the press speed best adapted for the job to be handled.

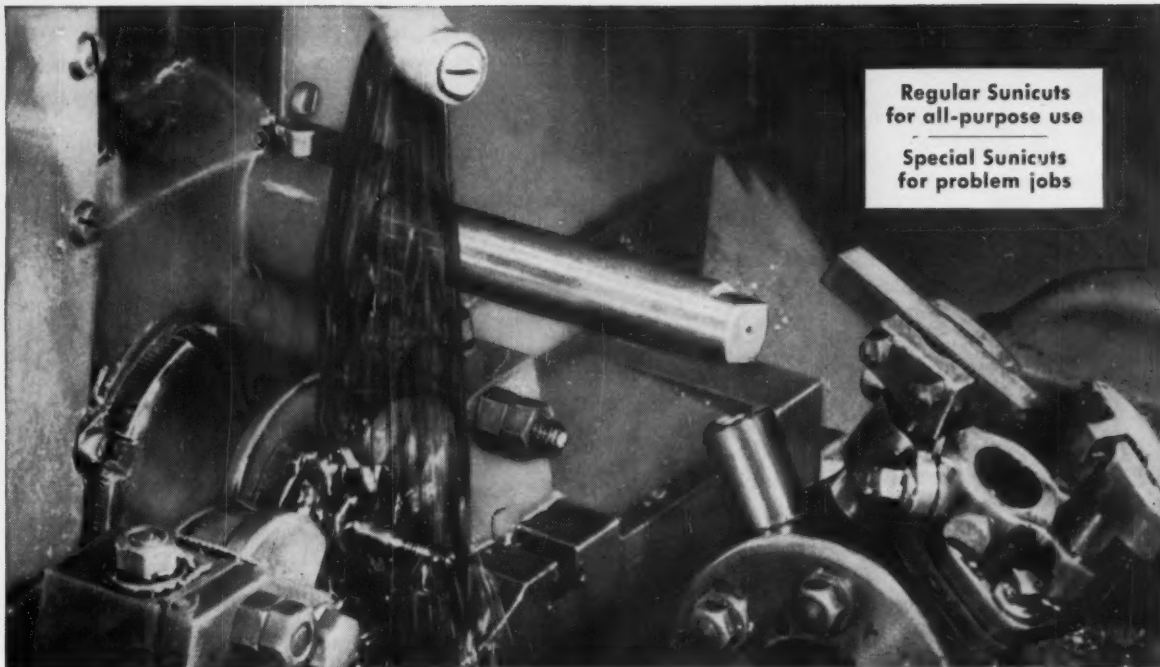
The air-balancing unit incorporated in these presses cushions the slide movement at both the top and bottom of the stroke. It will also prevent the slide from dropping due to possible failure of the connection or pitman components. The automatic lubrication unit is mounted between uprights in back of the press. A keyway is provided in the crankshaft for driving accessories such as roll feeds and scrap cutters.

Tie-rods and tie-rod spacers are provided to adapt these presses for precision, lamination, and other kinds of heavy-duty stamping operations performed on a production basis.

Circle Item 144 on postcard, page 245



Open-back inclinable press with air clutch placed on the market by Walsh Press & Die Co.



Regular Sunicuts
for all-purpose use
Special Sunicuts
for problem jobs

to assure peak production . . .

THERE'S A SUNICUT OIL FOR EVERY SCREW MACHINE OPERATION

Today's Sunicut cutting oils are the result of years of research and on-the-job testing. And they're versatile, too. In many plants *all* screw machine jobs are being handled by a single Sunicut grade.

For the problem jobs, Sun makes a wide variety of special Sunicut oils, each designed to do the job better.

Your Sun representative has the practical know-how to analyze *your* problems. Working with Sun's experienced engineering staff, he's ready to help you pick the Sunicut oil that will give you the tolerances and finishes you want.

The Sunicut series for screw machines is only part of a large selection of non-emulsifying and emulsifying cutting oils available to help you get peak production at the lowest possible cost.

For complete information about Sun cutting oils see your Sun representative... or write Sun Oil Company, Philadelphia 3, Pa., Dept. M-8.



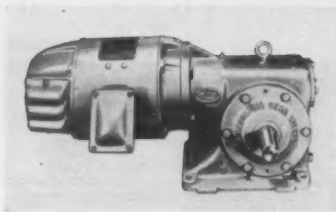
INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

For more information on products advertised, use Inquiry Card, page 245

MACHINERY, August, 1955—231



Philadelphia Motorized Worm-Gear Reducer

Motorized worm-gear reducer that is a self-contained, compact right-angle worm-gear motor available in a wide range of sizes from 1 to 50 H.P. with reduction ratios ranging from 3 5/8 to 1 up to 90 to 1. This gear reducer has been designed to meet the most severe industrial service requirements. Over size gearing and bearings are used for maximum strength. The flexible coupling which connects the motor-shaft and worm-shaft is enclosed within the gear unit to solve the alignment problem. Product of Philadelphia Gear Works, Inc., Philadelphia, Pa.

Circle Item 145 on postcard, page 245

Titanium Shear Bolts

Hi-Ti titanium shear bolts said to be equal to or better than comparable steel bolts. These bolts have been designed to solve the problem of putting the lightweight titanium metal to work in critical aircraft applications. Since the bulk of threaded aircraft fasteners are shear bolts, the new Hi-Ti bolts could cut as much as 1000 pounds from the weight of the largest aircraft. Each pound of

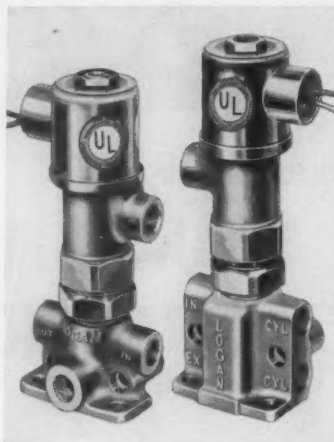


titanium bolts that is substituted for equivalent size steel bolts saves three-quarters of a pound of total weight. The new shear bolts, brought out by the Standard Pressed Steel Co., Jenkintown, Pa., like the Hi-Ti titanium tension bolts developed earlier in the year, are outgrowths of an extensive titanium research program sponsored by this company.

Circle Item 146 on postcard, page 245

Logansport Air-Control Valves

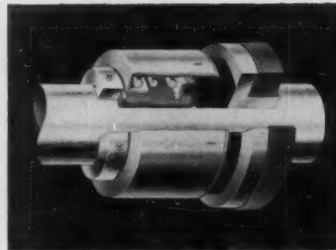
Model 6668 solenoid bleeder, air cylinder-actuated, two- or three-way air-control valve (left) brought out by the Logansport



Machine Co., Logansport, Ind. This valve is designed for electric push-button, limit switch or timer control of bleeder and pilot-operated master valves. Removing the plug in lower (center) port makes the two-way valve into a three-way valve adapted for side or base mounting. Varnish-impregnated coils for 115- or 230-volt, 50- or 60-cycle, alternating-current continuous-duty service are standard.

The Model 6669 dual-control two-way valve (right) is same as Model 6668 except that it has two exhaust openings which permit bleeding both ends of master valve alternately. This provides automatic reversal when electric current to the solenoid is shut off. Model 6678 four-way, two-position valve is designed for side or base mounting, and is electric push-button, limit-switch or timer-controlled for operating double-acting air cylinders.

Circle Item 147 on postcard, page 245



Seal for Rotary Shafts

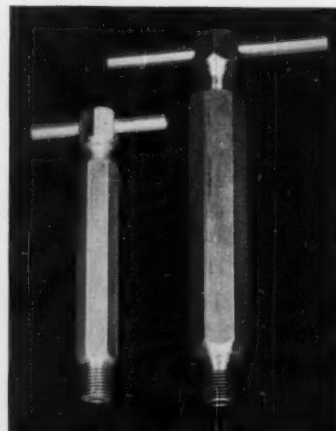
Mechanical seal announced by the Garlock Packing Co., Palmyra, N.Y., for rotary shafts at pressures up to 150 pounds per square inch. This Garlock "BB-21A MECHANIPAK Seal" is furnished ready to install. Standard construction includes brass shell, brass washer, and Buna-N bellows. Seals are available for shafts from 3/8 inch to 3 inches in diameter. The Buna-N, or neoprene, bellows are for temperatures up to 212 degrees F. and pressures up to 150 pounds per square inch. Silicone bellows are for temperatures up to 400 degrees F. 50 pounds per square inch.

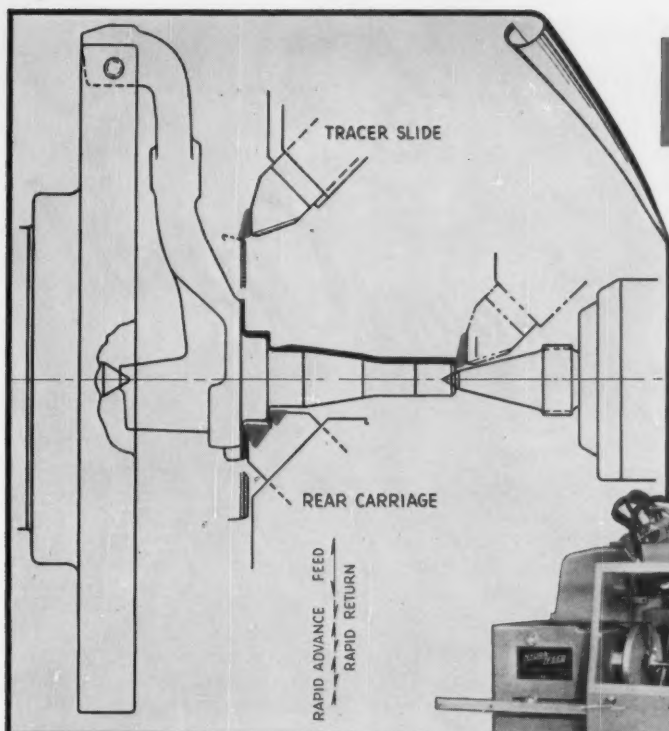
Circle Item 148 on postcard, page 245

Lubricator for Packing Pump Shaft Stuffing-Boxes

Extension lubricator for injecting lubricant as packing in pump shaft stuffing-boxes, offered by the Meter & Valve Division, Rockwell Mfg. Co., Pittsburgh, Pa. Available in brass or cadmium-plated steel, the new accessory comes in two over-all lengths of 6 3/8 inches and 8 7/16 inches. The longer model with the larger lubricant barrel is available with either 1/4-18 or 3/8-18 N.P.T. connector.

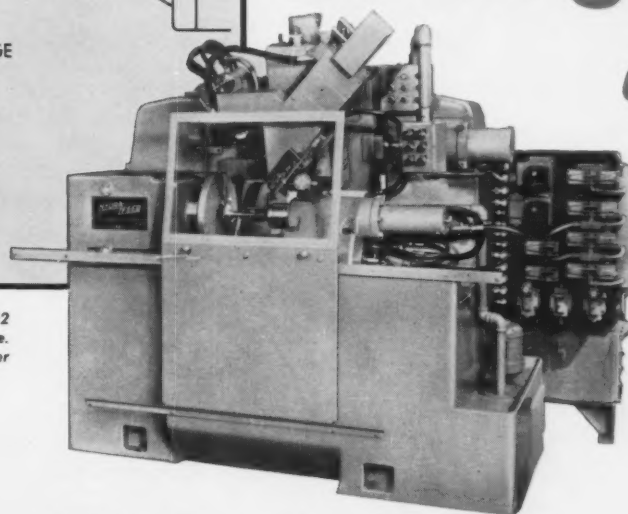
Circle Item 149 on postcard, page 245





Hydra-Feed Copy Turning!

It takes just 44 seconds floor-to-floor to machine this SAE 5132 steel automotive forging on the new Hydra-Feed tracer lathe. Note amount of stock removed in a single pass with tracer slide and rear carriage.



HYDRA-FEED TRACER LATHE:

- 1 . . . gets rid of the chip and dirt problem since tracer slide and template are located on the top carriage, well above the part being turned.
- 2 . . . gives you unobstructed loading and unloading—no slides or tools at the front of the machine.
- 3 . . . permits 2 or more operations to be performed in a single pass by using an auxiliary rear carriage for facing, grooving, chamfering, etc. Contour facing and turning are handled with auxiliary tooling, also.
- 4 . . . with its full width, full depth chip chute allows unobstructed chip flow even when taking the heaviest cuts. Standard automatic chip removal equipment can be added readily since a large opening is provided at rear of the machine.
- 5 . . . is available with either variable speed or conventional drive to suit your production requirements.

Plan to see
Hydra-Feed
copy turning
for yourself in
Booth 301
at the
Machine Tool
Show!



HYDRA-FEED MACHINE TOOL CORPORATION

SOUTH NORWALK, CONNECTICUT AND DETROIT (Ferndale), MICHIGAN

Address all inquiries to:

SALES AND ENGINEERING OFFICE, 730 W. EIGHT MILE ROAD, FERNDALE, MICHIGAN



Between Grinds

By E. S. Salichs

Graphic Traffic

Henry Ford, II, in a recent speech which you may have read, criticized some union leaders who resist the introduction of new machines and methods and seek to preserve obsolete trades and skills, putting it this way: "I'm all for chasing the sacred cows out of the stables of business."

Tempered to Taste

The potato chips you crunch so readily have a history, according to *Steelways*. Just before the Civil War at Moon Lake House in Saratoga Springs, N. Y., an Indian cook by the name of Aunt Kate tried to spite Jay Gould and his party of friends dining there by serving up French fries too thin to eat. The scalped potatoes became so popular that the J. D. Ferry Co., Harrisburg, Pa., developed a potato chip machine. Today's continuous-opera-

tion machines with slicing knives of high-carbon alloy steel attached to a stainless-steel rotor turning at about 260 R.P.M. are basically similar to the Ferry original.

Crunch

At the Pittsburgh Corning Corporation, two mixtures combining insulation and ceramic finish through the use of finely pulverized glass and chemicals are placed in a pan and baked. The result is a cellular insulating block that looks like a loaf cake with a white icing, the Armour Research Foundation of Illinois Institute of Technology tells us.

Fusing Flint

The Flint Project is a plan for an educational and cultural center undertaken by Flint people for immediate completion by raising a bond issue among the citizens and enlisting the support

of educators and other benefactors. For example, the General Motors Corporation has subscribed \$3,000,000 to the Project. And in a recent radio talk, Henry J. Taylor cited a retired tool and die maker who walked into the office of the Committee of Sponsors and gave \$25,000 because, he said, "This community has been good to me." The man, Merliss Brown (born Murdock Merliss in Minsk, Russia) came to Flint in 1908 and worked for forty-five years at General Motors, piling up a record of never missing a single day's work.

A Century of Search

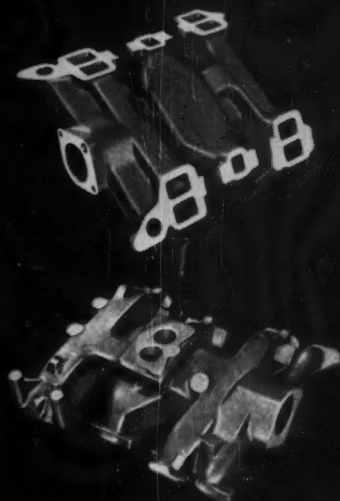
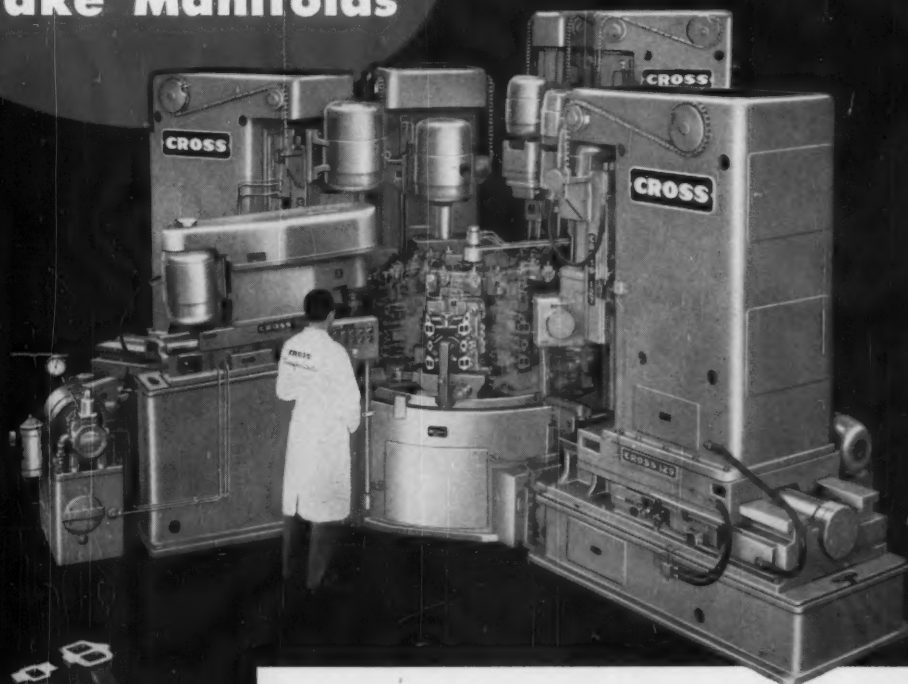
Continuous casting, *Steelways* tells us (the short-cut process by which steelmen are now able to make slabs, rounds, or ovals directly from molten steel), took 100 years to develop. Three slow and costly steps were eliminated—ingot molds, soaking pits, and blooming mills.



SONG OF THE WHEEL—If you tap a vitrified bonded grinding wheel lightly, it will emit a clear musical sound. In fact, one method of grading Norton wheels is to measure the pitch of their ring. Ordered to strike up the band, the four Norton bell-and-wheel ringers seen in the picture will play a happy tune on their unique instruments—the "Crucibells" (left), made from pure aluminum oxide refractory crucibles used in laboratories; the "Wheel-O-Phone" (center), strung together from 8-inch tool grinding wheels of slightly varying diameter or thickness; and the "Cathedral Wheel-O-Chimes" (right), composed of larger wheels commonly used for glass grinding.

Mills and Drills 2 and 4 Barrel Intake Manifolds

Another Special by Cross



- ★ Rough and finish mills mounting faces; mills, drills and chamfers water outlet pad.
- ★ 145 pieces per hour at 100% efficiency.
- ★ 7 stations: 1 loading, 4 milling, 1 drilling and 1 chamfering.
- ★ Hydraulic power clamping for work holding fixtures.
- ★ Automatic retraction for milling cutters.
- ★ Cross-Drive for milling cutters.
- ★ Pre-set tooling throughout.
- ★ Gravity operated cam clamping for indexing table.
- ★ Other features: Hardened and ground ways; hydraulic feed and rapid traverse; complete interchangeability of all standard and special parts for easy maintenance; Construction to J.I.C. standards.

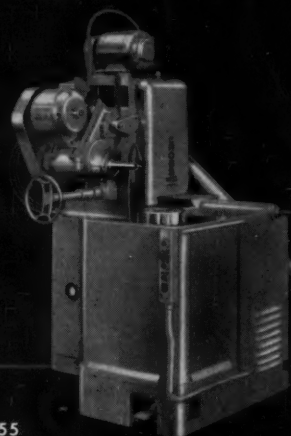
See us in Booth No. 1118 at the Machine Tool Show

Established 1898

THE **CROSS** CO.
DETROIT 7, MICHIGAN
Special MACHINE TOOLS

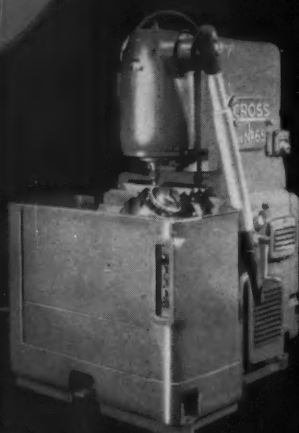
Greater Flexibility with Cross Gear Machines

for rounding • chamfering • pointing • burring



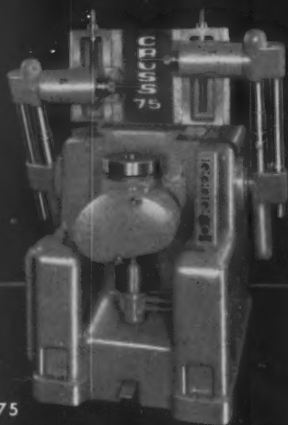
NO. 55

For rounding, pointing, chamfering or burring external and internal—
spur gears • helical gears
clutches • splines
Typical production—rounding or pointing
8 pitch 30 tooth gears—55 net hourly.



NO. 65

For pointing or chamfering external and internal—
clutches • spur gears
bevel gears • splines
Typical production—pointing 10 pitch 30
tooth gears—100 net hourly.



NO. 75

For burring or chamfering both ends at the same time—
helical gears • spiral bevel pinions
hypoid pinions
Typical production—chamfering 8 pitch 40
tooth gears—200 net hourly.

- ★ Flexibility for handling a wide variety of gears.
- ★ Rugged, heavy duty construction for continuous high production or job shop operation.
- ★ Short setup time (as little as 15 minutes) for changing from one gear to another.
- ★ Simple, inexpensive tooling.
- ★ Push button controlled automatic cycle.
- ★ Hydraulic power work clamping.

For mass production or short run jobbing operations, there is a Cross Gear Machine to suit your requirements.

Established 1898

THE **CROSS** CO.
DETROIT 7, MICHIGAN
Special MACHINE TOOLS

News

OF THE INDUSTRY

Illinois

LINK-BELT Co., Chicago, Ill., has appointed the following men as distributor representatives: GEORGE L. GANSZ, operating from headquarters in Philadelphia, will be the representative for all distributors in the eastern and southeastern states; ALBERT A. QUINN, operating from Chicago, will perform the same function for distributors located in the midwestern and southwestern states; and HAROLD J. GUIVER will serve in a similar capacity on the West Coast from headquarters in San Francisco.

SUNDSTRAND MACHINE TOOL Co., Rockford, Ill., recently completed an addition to its Machine Tool Division facilities at Belvidere, Ill. The new plant will be used primarily for the assembly of the larger models of standard Rigidmils, special machines, and transfer type equipment. The new unit adds approximately 29,000 square feet to the company's facilities.

SCULLY-JONES & Co., Chicago, Ill., has appointed as distributors the Iowa Machinery & Supply Co., Des Moines, Iowa, and the Southern Tool Engineers, Birmingham, Ala.

J. RUSSELL MCGEE has been appointed manager of distributor sales by Danly Machine Specialties, Inc., Chicago, Ill. Mr. McGee has spent seventeen years in the industrial distribution field.



J. Russell McGee, manager of distributor sales, Danly Machine Specialties, Inc.



(Left) Horace Tennes, division manager; (right) John N. Tufts, sales manager, Shafer Bearing Division, Chain Belt Co.

SHAFFER BEARING DIVISION, Chain Belt Co., Downers Grove, Ill., has made the following appointments: HORACE TENNES has been made division manager. He succeeds RAY P. TENNES, who retired in May. JOHN N. TUFTS has been made sales manager of the division.

WYMAN-GORDON Co., Worcester, Mass., has purchased a substantial interest in the Prex Corporation, Chicago, Ill. Immediate plans for expansion are for the construction of a new plant on land in Franklin Park, northwest of Chicago, Ill. Present Prex facilities, including those of their Midland Die & Engraving Division, will be moved to the new plant.

HYDRA-FEED MACHINE TOOL CORPORATION, Ferndale, Mich., announces the appointment of NEFF, KOHLBUSCH & BISSEL, INC., 5700 North Ave., Chicago, Ill. to handle sales and application engineering of the company's automatic and tracer lathes in Northern Illinois, Lake County Indiana, Eastern Wisconsin, and Eastern Iowa.

W. J. PARKER, formerly with the Wheelco Rock Island, Ill., office, will now be associated with the Cleveland, Ohio office of the Barber-Colman Co., Rockford, Ill. RUSSELL RODERICK will assume Mr. Parker's activities in the Rock Island area.

ONSRUD MACHINE WORKS, INC., Chicago, Ill., has transferred its Metal-working Machine Division to

its new plant at 7720 N. Lehigh Ave., Niles, Ill. The Woodworking Machinery & Turbine Tool Division will remain at 3900-32 W. Palmer St., Chicago, Ill.

ROBERT KROGH has been made sales manager for Ipsen Industries, Inc., Rockford, Ill. Mr. Krogh has been with the sales staff since 1950 and during this time has served as sales engineer and district sales manager in the Detroit and Cincinnati territories.

WILTON TOOL MFG. Co., INC., Schiller Park, Ill., has completed occupancy of its new general office and factory building at 9525 Irving Park Road, Schiller Park, Ill. The new factory has a total of 68,000 square feet of floor space, all on one floor.

ROY C. INGERSOLL has been elected president and chairman of the board of the Borg-Warner Corporation, Chicago, Ill. The post of chairman has been vacant since the death of C. S. Davis last year.

WHEELCO INSTRUMENT DIVISION, Barber-Colman Co., Rockford, Ill., has announced that its Chicago office will move into new facilities at 6610 N. Sheridan Road, Chicago.

FRANK J. HODER, JR., has been named general manager of the MICRO-PRECISION DIVISION of Micro-matic Hone Corporation, Evanston, Ill.

Indiana

SALES SERVICE MACHINE TOOL Co., St. Paul, Minn., has announced the appointment of the State Machinery Co., 1800 N. Meridan St., Indianapolis, Ind., as representative for Press-Rite presses in Indiana and western Kentucky.



Kenneth P. Martin, vice-president in charge of sales, National Automatic Tool Co., Inc.

KENNETH P. MARTIN has been appointed vice-president in charge of sales of the National Automatic Tool Co., Inc., Richmond, Ind. He succeeds the late Mr. E. D. FRANK.

CHRYSLER CORPORATION, Detroit, Mich., announces the formation of a new manufacturing division embracing four of the company's plants in Indiana. Designated as the Supply Division of Chrysler Corporation, the new operations unit will be headed by R. S. BRIGHT, general manager. The newly formed division consists of the company's present manufacturing plants in Indianapolis, New Castle, Kokomo—formerly operated by the Dodge Division—and a new automatic transmission plant under construction at Kokomo.

Michigan

HOWELL ELECTRIC MOTORS Co., Howell, Mich., has made the following changes in its sales organization: A new district office has been added in Saginaw, Mich. R. W. HOGAN has been appointed district manager. Tate & Scanlon, manufacturers' representatives, with headquarters in Dallas, Tex., will handle the Howell line in northern Texas. LYNN F. HUMMEL has been named sales representative in Florida with headquarters in Orlando. JOHN P. LOGAN has been appointed sales

engineer in Arizona and southern California with headquarters in Los Angeles.

MINNESOTA MINING & MFG. Co., St. Paul, Minn., announces the following new positions in its Adhesives & Coatings Division at Detroit, Mich.; HOWARD F. NORMAN has been appointed product manager of industrial trades. His duties include coordination of sales activities in the eastern and Great Lakes sales areas. He will make his headquarters in Detroit. AUGUST KOCHIS has been named government representative for the division and will make his headquarters at the company's government office in Washington, D. C.

MICHIGAN STEEL CASTING Co., Detroit, Mich., has acquired the Standard Alloy Co., Cleveland, Ohio. The latter firm has moved its operations into the larger plant at Detroit and the Cleveland plant has been sold. The name now becomes Michigan-Standard Alloy Casting Co. It will continue to be a division of Consolidated Foundries & Mfg. Corporation, and the trade name "Misco" will be retained.

VAN NORMAN Co., Springfield, Mass., has announced the acquisition of the SUPER TOOL Co. which has two plants at Detroit and Elk Rapids, Mich. The business will be operated as a wholly owned subsidiary of the Van Norman Co. Its operations will be coordinated with the Morse Twist Drill & Machine Co., New Bedford, Mass., which is another subsidiary.

FLIGHTEX FABRICS, INC., Providence, R. I., has purchased Madison Mfg. Co., Muskegon, Mich., and Madison Industries, Inc., Big Rapids, Mich. Both concerns will operate as wholly owned subsidiaries and continue to manufacture Madison adjustable boring and reaming tools, gun drills, trepanning tool, bore gages, and grinding fixtures.

COLONIAL BROACH Co., Detroit, Mich., has changed its name to the COLONIAL BROACH & MACHINE Co. The thirty-seven year old firm feels the new name is more descriptive of their products, as production of broaching machinery has become a larger factor in their operations.

GRAWELL CARBIDE TOOL Co., Detroit, Mich., is a new company which has been organized by RAYMOND C. HEARTWELL, LAWRENCE J. HEARTWELL, and ANNE E. GRAHAM to manufacture solid carbide cutting tools. The company is located at 5680 Twelfth St., in Detroit.

C. G. HOGBERG has been made assistant to the vice-president of the Michigan Limestone Division, United States Steel Corporation, Detroit, Mich. Mr. Hogberg will assume his

new position at the general offices of the division in Detroit.

SNYDER TOOL & ENGINEERING Co., Detroit, Mich., has begun work on a \$500,000 expansion program. The 20,000-square foot factory expansion is being made at the company's main plant at 3400 E. Lafayette Ave., Detroit. Completion is expected by early fall of this year.

BURLEIGH AND STOCKER MACHINE TOOL Co., Pleasant Ridge, Mich., has been made sales agent for the Airborne Instruments Laboratory, Inc., Mineola, N. Y.

New England

HARTFORD SPECIAL MACHINERY Co., Hartford, Conn., has appointed the following divisional sales managers: L. K. SHEPARD, sales manager of the Machine Tool Division; HARVEY L. SPAUNBURG, Jr., sales manager of the General Contract Division; and ARNOLD T. SUHART, sales manager of the Machine Tool Accessory Division.

FRANCIS L. DABNEY, assistant secretary and treasurer of the Bulard Co., Bridgeport, Conn., has also been elected a director of the company. He became associated with the company in 1953.

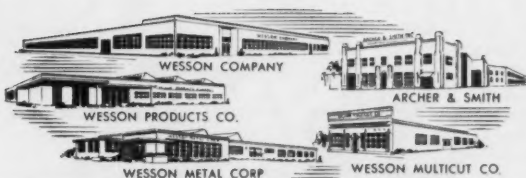
MILTON E. BERGLUND has been elected executive vice-president of the Torrington Co., Torrington, Conn. He joined the company in 1927.

LELAND-GIFFORD Co., Worcester, Mass., announces the appointment of K. L. WESSLING & Co., St. Louis, Mo., as representative of their line of drilling machines in southern Illinois and eastern Missouri.

C. HERBERT QUICK has been appointed assistant to the director of research and development of Norton Co., Worcester, Mass. He has been with the company since 1924, and was first employed in the research laboratory.

JOHN C. MOLINAR has been appointed general sales manager of the Union Twist Drill Co., Athol, Mass. He succeeds W. E. LOY, who will continue as treasurer of the company.

JONES & LAMSON MACHINE Co., Springfield, Vt., announces the purchase of SHOPMASTER, INC., Minneapolis, Minn., manufacturers of power tools for the home workshop. Newly elected officers of Shopmaster, Inc. are H. L. ANDREWS, president; L. H. MILLER, vice-president and general manager; E. R. KOESTER, vice-president in charge of manufacturing; H. H. WHITMORE, treasurer; and N. T. HARRISON, secretary-controller.



carbide NEWS

New Wessonmetal "26" Boosts Tool Life 40%

*Optimum performance of "nearly universal"
grade extends over range of 100 to 400 sfm*

Gains in tool life ranging up to 40% over other steel cutting grades are reported for Wesson Metal Corporation's new Grade 26. The new steel cutting carbide has consistently outperformed all other steel cutting grades in 95% of all machining operations on which it has been applied.

Indications now are that the new Grade will produce significant increases in tool life over approximately 80% of the entire steel machining range. While created primarily to handle all types of steel rough and semi-finish machining—light, medium and heavy duty—it also is proving highly effective on some finishing operations.

What is more, the new Wessonmetal grade is not limited to a narrow range of cutting speeds. Optimum performance for Grade

26 extends over a range of 100 to about 400 sfm, covering 95% of steel machining operations encountered in industry today.

Since Grade 26 is the closest approach to a "universal" carbide for steel cutting yet produced, it reduces the number of grades required for steel cutting operations by as many as four grades. Problems of grade selection are greatly simplified, therefore, by the new Wessonmetal grade.

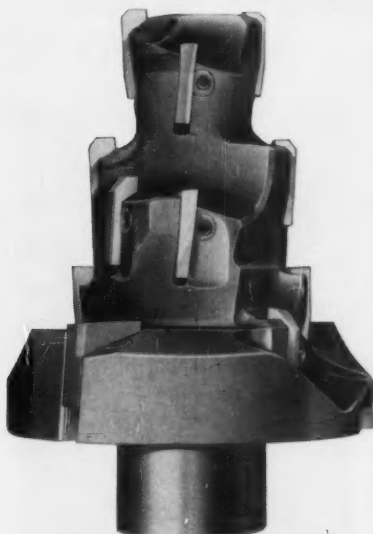
Much of Grade 26's outstanding performance is due to its superior cutting edge strength. Particularly important at the elevated temperatures generated at high cutting speeds, are the carbide's inherently high red hardness combined with high thermal conductivity.

Grade 26 is now in full production at



Tool life took a big jump on this severe interrupted cut on a forged steel tractor brake band anchor. Cutting speed ranges from 280 sfm down to zero. Feed is .027", depth of cut is 1/8".

Wesson Metal Corporation's new metals plant in Lexington, Ky.



A total of eight chamfering, semifinishing, finish boring and facing operations are performed at each of five stations with these cutters on a W. F. & John Barnes boring machine.

Multi-Diameter Cutters Slash Tool and Machining Costs

Special eight-operation cutters designed by Wesson Company engineers permit a major builder of commercial air conditioning units to achieve a sizable reduction in the cost of machining compressors.

Solid Wessonmetal Grade GS blades are used on the cutters to produce 3600 cylinders per grind, compared with only 250 cylinders per grind previously. Grinding

takes one-third as long as on tools previously used.

Although solid carbide blades are used on this operation, these special multi-diameter cutters are typical of the many other special Wesson designs incorporating standard blades which provide interchangeability of solid carbide, carbide tipped or HSS blades without modifying blade slots.



For answers to
your machining
problems write:

WESSON COMPANY, DEPT. AD, 1220 Woodward Heights Blvd., Detroit 20, Michigan

New York and New Jersey

ROBERT G. EMRICK, former executive vice-president, has been elected president of Etco Tool Co., Inc., Brooklyn, N. Y. He succeeds his



Robert G. Emrick, president of Etco Tool Co., Inc.

brother, MELVIN H. EMRICK, who has been made chairman of the board of directors.

BRAKE SHOE & CASTINGS DIVISION, American Brake Shoe Co., New York City, announces the following executive appointments: FRED BIGGS, formerly division president, has been appointed division chairman. He joined the division as a sales inspector in 1916 and has been an officer since 1944. STEPHEN S. CONWAY, former first vice-president in charge of sales, has been named president. He has been with the company since 1912 and has held various administrative and sales positions with the division since 1929. JOHN F. DUCEY, JR., has been made sales vice-president. Mr. Ducey joined the company in 1936. SAM R. WATKINS has been named to the post of division vice-president in charge of railroad sales.

GENERAL ELECTRIC Co., Schenectady, N. Y., announces the following appointments: GORDON T. GRAHAM has been named manager of marketing for the company's Small Integral Motor Department, Fort Wayne, Ind.; W. G. LEAMAN has been appointed manager of a new direct-sales office and warehouse in Buffalo, N. Y., for the General Electric Welding Department, York, Pa.; and FRANK M. MANSFIELD, III, has been appointed manager of product planning and marketing research for Carboly Department of General Electric Co., Detroit, Mich.

SHELL CHEMICAL CORPORATION, New York City, has made the following management changes in the

marketing department: W. C. LOWREY is manager of the Newark, N. J., district; W. A. MCCORMICK is district manager, St. Louis; R. W. CAMPBELL is district manager in Los Angeles, Calif. He replaces J. E. TOEVS, recently appointed sales manager of the newly created Synthetic Rubber Sales Division. G. E. GARLAND, former district manager in New York, is named to the sales manager's staff. D. P. JONES succeeds Mr. Garland as district manager in New York.

GEMCO, INC., New York City, is a newly organized company which will provide a range of services to industrial and business enterprises, particularly in the field of metalworking and durable goods. FREDERICK W. RICHMOND is president of the company; CHARLES G. BEAVERS, JR. has been made vice-president of sales; and DESALES HARRISON, JR. has been made vice-president of operations.

BEHR-MANNING DIVISION of NORTON Co., Troy, N. Y., announces the following executive appointments: THOMAS TROWBRIDGE has been made assistant general sales manager; WILLIAM J. BENNETT has been appointed sales manager for the company's Eastern region; and VICTOR F. PERREAULT has been made industrial trades manager.

FREDERICK C. KROFT has been appointed general superintendent of manufacturing for Haynes Stellite Co., a division of Union Carbide and Carbon Corporation, New York City.

TOWNSEND WHEELER has been appointed central New York regional sales representative by Russell, Burdshall & Ward Bolt and Nut Co., Port Chester, N. Y. Mr. Wheeler will make his headquarters in Syracuse.



ATKINS SAW DIVISION, Borg-Warner Corporation, Indianapolis, Ind., has announced the appointment of the E. F. McCarthy Co., Inc., N. Y., as the Atkins industrial distributor in the Buffalo, N. Y., area.

ARTHUR E. DARCY has been appointed manager of the Machine Methods Department of the Coated Abrasives Division of The Carborundum Company, Niagara Falls, N. Y.

BARBER-COLMAN Co., Rockford, Ill., has obtained the manufacturing rights for the products of the Hendey Machine Co. Hendy tool-room and production lathes, and shapers will be manufactured by the Hendey Machine Division of Barber-Colman Co., at Rockford, Ill. The company's office in Bergenfield, N. J., will now represent the Hendey line of lathes and shapers. C. G. EGGLESTON, EINAR REVES, and GEORGE A. HAZLEY are machine tool engineers on the staff of the Bergenfield office representing the acquired products.

DE LAVAL STEAM TURBINE Co., Trenton, N. J., has announced an extensive long-range expansion program. Land has been purchased for construction of buildings in Trenton, N. J., and Houston, Tex., in addition to building plans already under way near Chicago, Ill., and San Francisco, Calif. The expansion program is the outcome of a major survey begun in 1953.

Ohio

CINCINNATI MILLING & GRINDING MACHINES, INC., Cincinnati, Ohio, announces the following appointments: ALFRED T. BLACKBURN, works manager, and E. D. VANCIL, manager of Process Machinery Division, Cincinnati Milling Machine



(Left) E. D. Vancil, vice-president and director; (right) A. T. Blackburn, vice-president and director, Cincinnati Milling & Grinding Machines, Inc.



NEW STYLE 46-D

For accurate reconditioning of all types of single-point boring, turning and facing tools; also dovetail and straight shank form tools. This grinder has a new in-built motor spindle designed for maximum rigidity. Wheels are mounted on the spindle shaft. Ball bearings are lifetime lubricated. Tool rest tables are at a comfortable height for operator convenience.



**NEW
STYLE
49-A**

A heavy-duty grinder that takes carbide, cast alloy and high-speed steel tools, medium and large size.

This new grinder has a new coolant system; is easier to clean and stays clean longer; troughs and coolant return lines are bigger, more accessible, and a settling tank is added.

NEW

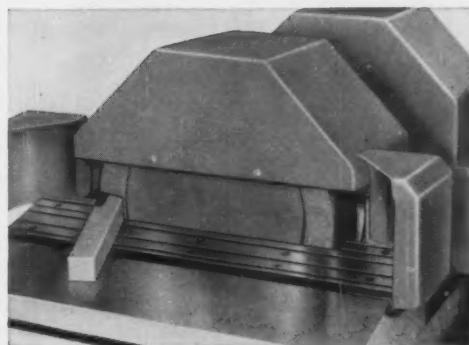
EX-CELL-O

CARBIDE

TOOL

GRINDERS

STYLES 46-D AND 49-A



LARGE TOOL REST TABLES

Illustrated is the tool rest table on the Style 49-A. It supports the biggest tools firmly. Adjustment is quick and easy to the required angular setting, and to compensate for wheel wear.

Wheel spindle is permanently lubricated.

There's an Ex-Cell-O Grinder to suit the needs of every shop, large or small. For new low prices on the above models, and for data on Ex-Cell-O's complete tool grinder line, write to Detroit, or call your local Ex-Cell-O Representative.

SEE EX-CELL-O
AT THE
**MACHINE TOOL
SHOW**
CHICAGO, SEPT. 6-17
BOOTH 1319



55-2

EX-CELL-O

CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS •
GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS
AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND
MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Co. were each elected vice-president and director of the company's sales organization, Cincinnati Milling & Grinding Machines, Inc. Both men have been associated with the parent company for many years.

OSBORN MFG. Co., Cleveland, Ohio, announces the following sales appointments: JAMES H. GERTZ will cover the Western New York State area, with headquarters in the vicinity of Buffalo. LANE JONAP will succeed Mr. Gertz in Minneapolis where he will cover the Minneapolis, Minn., Iowa, and Nebraska territory. HOWARD A. SIMONS succeeds Mr. Jonap in the Cleveland, Ohio area.

DENISON ENGINEERING Co., Columbus, Ohio, has promoted PAUL W. NORRIS to vice-president and director of sales. Mr. Norris joined Denison



Paul W. Norris, vice-president and director of sales, Denison Engineering Co.

in 1934 as an assembly mechanic and service engineer, and after a series of promotions, was named director of sales in February of this year. He has complete supervision and responsibility for all domestic sales, advertising service, and sales promotional activity.

WARNER & SWASEY Co., Cleveland, Ohio, has made the following appointments: RICHARD PFUNDER, who has headed sales in the Atlanta, Ga., territory, has been appointed district manager of the Pittsburgh, Pa., territory with headquarters there. LEONARD J. FOX, formerly of the company's Erie, Pa., sales office, succeeds Mr. Pfunder in Atlanta.

J. W. WEIR, Cleveland, Ohio district manager of the Timken Roller Bearing Co., Industrial Division in Canton, Ohio, has retired after thirty-six years of service. Mr. Weir began his employment in 1919 as an

engineer working on plant lay-out and machine design.

OSTER MFG. Co., Cleveland, Ohio, has begun construction of its new building on 239th Street, Wickliffe, Ohio. Occupancy is scheduled for September and the main plant and office will then move to the new site.



Malcolm Roberts, sales manager for Leland-Gifford Co.

MALCOLM ROBERTS has been made sales manager for the Cleveland, Ohio, sales district of Leland-Gifford Co., Worcester, Mass.

A. F. DAVIS, vice-president and secretary of the Lincoln Electric Co., Cleveland, Ohio, was among the first recipients of a new award established by the Ohio State University to pay tribute to its outstanding engineering alumni. The first "Distinguished Alumnus" awards were presented at the Second Annual Engineering Conference for Engineers and Architects held in Columbus on May 6.

PAUL ANDREWS has been appointed sales representative for Wood & Spencer Co., Cleveland, Ohio. His territory covers the city of Cleveland, west of E. 559th St., as well as the city of Elyria and of Lorain.

SIDNEY MACHINE TOOL Co., Sidney, Ohio, announces the appointment of the FORD MACHINERY Co., Toledo, Ohio, as its representative in Toledo and northwestern Ohio.

EUGENE L. MACKEY has been promoted to director of engineering at the Yoder Co., Cleveland, Ohio. He has been with the company for twenty years.

GROB, INC., Grafton, Wis., has licensed the Lees-Bradner Co., Cleveland, Ohio, to develop, manufacture, and market the Grob gear-rolling process.

Pennsylvania

ALLEGHENY LUDLUM STEEL CORPORATION, Pittsburgh, Pa., announces the following changes in its sales division: RICHARD J. SWAN has been appointed director of sales of magnetic and electronic materials; MILTON M. FENNER, JR., has been appointed director of sales of tool and die steels; KARL A. ELSERS has been made Pacific Coast area manager; IRVING R. LEHENEY has been made tool steel product manager; HENRY N. ANTHONY has been named district manager at Philadelphia, succeeding F. PRICE NORRIS, JR., who has recently been appointed director of sales of stainless and specialty steels, with headquarters in the general office in Pittsburgh; ROYDEN C. PRESLEY has been named district manager at Buffalo, N. Y.; and WALTON P. MCCORD has been made district manager at Birmingham, Ala.

CARPENTER STEEL Co., Reading, Pa., announces the following changes: H. STURGIS POTTER, vice-president in charge of sales, and ARLINGTON A. BRITTON, JR., vice-president in charge of production, were elected to the board of directors. Both will also continue in their positions as vice-presidents. DR. CARL B. POST has been promoted to vice-president in charge of metallurgy. BERTON H. DELONG has retired from the board of directors.

WILLIAM P. DRAKE, formerly executive vice-president of Pennsylvania Salt Mfg. Co., Philadelphia, Pa., has been elected president. He succeeds GEORGE B. BEITZEL, who will continue his association with the company as a member of its board and as chairman of the board of the Pennsalt International Corporation, a subsidiary.

H. K. PORTER Co., INC., Pittsburgh, Pa., has purchased the Vulcan Crucible Steel Co., Aliquippa, Pa., tool steel manufacturer, which becomes the company's twelfth division. JAMES O. FLOWER is vice-president and general manager of the new division.

GEORGE F. POWELL has been named manager of the government sales department of the Delta Power Tool Division of Rockwell Mfg. Co., Pittsburgh, Pa. K. G. SMITHYMAN will fill Mr. Powell's former sales post as Pittsburgh district sales manager for the company.

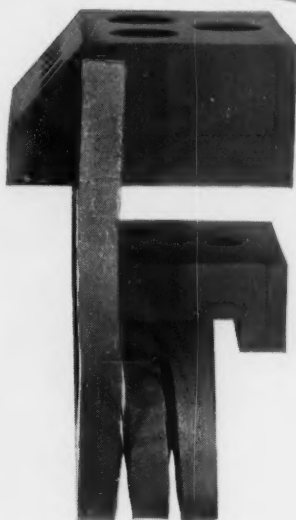
NATIONAL TOOL Co., Cleveland, Ohio, announce the appointment of the W. H. JONES Co., Wallingford, Pa., as sales representative in eastern Pennsylvania, southern New Jersey, and Delaware.

(This section continued on page 250)



SAVES MONEY BY USING Revere Extruded Shapes

PROBABLY YOU CAN TOO!



Overload device, OD-2, made by I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia, Pa., using Revere Copper Extruded Shapes.

Actuating mechanism, showing overload coil brazed to two Revere Extruded Shapes.

Here is a photograph of the I-T-E Dual Selective Overcurrent Trip, an air circuit breaker part. It contains two Revere Extruded Shapes, in copper. In the detail view, the beveled shape at the top is furnished in Free-Cutting Copper, to speed up the drilling and tapping of the holes. The piece below it was originally milled from rectangular copper bar, 1 x 2 inches. The bar weighed 7¾ lbs per foot, and 1.8 lb of scrap per foot was generated in machining it to the angular form shown. The company then switched to a Revere Extruded Shape, weighing a little less than 6 lbs per foot. Though the shape inevitably costs more per pound than the bar, the reduction in weight was sufficient to save almost 44¢ per foot over the bar, and of course additional savings were realized in reduced machining time and in scrap handling. Production also was speeded up. This is an outstanding example of the economies offered by shapes.

Look into extruded shapes, in copper and copper-base alloys, and aluminum alloys. The nearest Revere Sales Office will be glad to explore the subject with you.



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FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY



Technical-ities

By John S. Davey

The Proper Loading of Bolts

The pre-load, or residual tension, in a tightened bolt means more to assembly strength than the actual strength of the bolt itself.

In a joint, a bolt torqued to its proper load level resists a maximum amount of external load without loosening. Designers can take advantage of this fact and assure better results, and at the same time, cut costs.

For example: One designer calculated that truck frames needed high strength bolts at least $\frac{1}{4}$ " in diameter. So he used $\frac{3}{8}$ ". But on the assembly line, these were being torqued to 100 ft.-lbs. whereas they needed at least 200 ft.-lbs. for proper residual tension. The $\frac{1}{4}$ " bolt at 100 ft.-lbs. would actually have given the stronger assembly and at less cost.

In another case, the bucket on earth moving equipment was always coming loose. The design engineer kept increasing the size of the bolt up to $1\frac{1}{4}$ ", but to no avail. The impact wrench used was supplying far too little torque for this size. We suggested a return to the original $\frac{3}{4}$ " bolt used, set up to 350 ft.-lbs. torque. It solved the problem.

In short, the more you stress a bolt within its elastic limit, the greater its ability to stay tight and make a strong assembly.

Symmetrical flow lines assure strong bolt heads



Photo of perfect cold worked blank after first upset.



Effect of improper forming is a poor head like this.

IN THE manufacture of bolts and cap screws, the first upset of metal is a vital one. It determines the flow lines in the bulb which will form the head. A symmetrical flow assures no laps and, therefore, no weak spots or cracks in the final upset of the head.

MACHINE OPERATOR'S SKILL VITAL

The upper photo shows a longitudinal section of a blank after the first upset and on its way to becoming an RB&W standard bolt. Note the even distribution of flow lines. This bulb will become a perfect head.

The lower photo shows what can happen with poor tools, inexperienced operators or without precision setup of the cold headers. Note how pronounced is the unbalanced flow pattern which resulted from a bulb with just a minute defect.

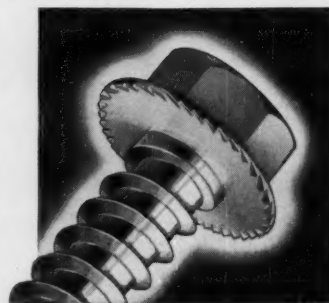
DEPENDABLE FASTENERS

Cap screws and bolts also get a bright smooth finish from the right kind of cold forming. But above all, they offer the designer low cost fasteners with sound internal structure. Standard RB&W fasteners can be loaded to their proper level—become a strong point in any assembly.

For help on your fastener problem, contact Russell, Burdsall & Ward Bolt and Nut Company. Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

The Only Screw That Stays Tight

The continual heating and cooling caused loosening of handle screws on the flat irons of one manufacturer. Every type tried failed to stay tight until RB&W's unique Spin-Lock tapping screws were used. This solved the problem. Their hardened teeth lock into the surface, require more torque to loosen than to tighten. One piece fasteners, they speed assembly time.



PRODUCT INFORMATION SERVICE

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On New Catalogues described in this issue of **MACHINERY**
On products mentioned in the editorial pages
On products shown in the advertisements

NEW CATALOGUES

HEAVY-DUTY 32-INCH LATHE—American Tool Works Co., Cincinnati, Ohio. Bulletin 26, containing 30 pages on the new addition to the Pacemaker line, a 32-inch "American" Style "H" lathe. It is designed and proportioned to fill the gap between the 25-inch heavy-duty and 32-inch heavy-duty Pacemaker sizes. Suitable for a large percentage of conventional 32-inch lathe work and for general maintenance and repair operations, it is adequately powered and convenient and easy to operate. The booklet includes illustrations and descriptions of lathe components and complete dimensions and specifications. 1

SURFACE ROUGHNESS MEASUREMENT—Micrometrical Mfg Co., Ann Arbor, Mich. Catalogue containing 12 pages on Profilometer equipment for shop measurement of surface roughness. Items described include the portable Amplimeter and tracers for manual and mechanical operation, and motor-driven piloting equipment for straight-line, short-stroke, and circular tracing. An introductory section includes a listing and shop shots of the three combinations of equipment most commonly used. 2

AUTOMATIC SCREW MACHINE—Brown & Sharpe Mfg. Co., Providence, R. I. Bulletin SM21 containing 12 pages on the company's No. 00 automatic screw machine. It also describes many new and exclusive features such as chain-driven ball-bearing spindle with a maximum speed of 7200 R.P.M. and ample horsepower. Because of its advanced design and construction, carbide tooling can be used on many jobs. Specifications, diagrams, and illustrations are included. 3

HYDRAULIC PRODUCTION PRESSES—Elmes Engineering Division, American Steel Foundries, Cincinnati, Ohio. Bulletin 1036-B, giving complete description and specifications on Elmes Hydrolairs, small hydraulic production presses powered solely by compressed air. Text includes full dimensional and operational data, tonnage capacities, and specifications on electric and steam-heated hot plates. Among the uses listed are plastics and rubber molding, assembly forcing, laminating, and compacting. 4

TOOL STEEL GUIDE—Vanadium-Alloys Steel Co., Latrobe, Pa. 70-page brochure presenting technical data on more than fifty types of tool steels and cold-finished

products. Information is included on high-speed steels, die steels for hot work, die steels for cold work, carbon and carbon-vanadium tool steels, chrome-vanadium tool steels, and tool steels for special purposes. Sections also are devoted to cold-finished products and powdered metal. 5

FINGERPRINT REMOVER—E. F. Houghton & Co., Philadelphia, Pa. 4-page bulletin describing Cosmoline 1070 fingerprint remover developed to reduce rejection of metal parts caused by corrosion started from fingerprints. Effective on non-ferrous and bimetallic assemblies, it meets government specifications. Features include rupture-resisting film, easy removal by solvent prior to application of final finishes, non-toxicity, high anti-humidity properties, and long stability in storage. 6

STUB TAPS—Besly-Welles Corporation, Beloit, Wis. 4-page folder featuring new stub-tap standards just developed by the National Screw Machine Products Association, plus giving details on the company's own stub taps manufactured according to these standards. Photographs, engineering drawings, and charts are included. Detailed information is given on a shorter-length tap that will fit screw machines without alteration. 7

GAGE-BLOCK ACCESSORIES—Ellstrom Standards Division, Dearborn Gage Co., Dearborn, Mich. Leaflet describing and illustrating the complete line of the

company's square and rectangular gage-block accessories and describing how they can be easily and quickly assembled to give accuracy on special production and inspection operations. Specifications, illustrations, and complete price information is included. 8

HIGH-VOLTAGE MOTOR STARTERS—Industrial Control Department, General Electric Co., Schenectady, N. Y. Bulletin GEA-6331 outlining in detail the features of the high-voltage, current-limiting, fused starters for coordinated control of squirrel-cage, synchronous, wound-rotor, and multi-speed motors. Simplified installation and reduced space requirements are covered thoroughly. 9

CARBIDE TOOLS AND BLANKS—Adamas Carbide Corporation, Kenilworth, N. J. Price list 355P, consisting of 8 pages on the company's standard carbide tools and blanks in Premium Grades 548 and 434. The booklet features a unique guide for the selection of steel cutting grades, and has a table which shows the proper grade to use to eliminate carbide failure caused by improper grade selection. 10

AUTOMATIC INDEX-TABLE—Cleveland Tapping Machine Co., Canton, Ohio. Bulletin 250, containing information on the company's positive power-driven automatic index-tables for drilling, tapping, and other sequence operations. It also gives data on operation, construction, indexing cycle, indexing drum op-

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eration, and load capacity. Illustrations, dimensions, and specifications are included.11

BASIC STEEL PRODUCTS—Joseph T. Ryerson & Son, Inc., Chicago, Ill. Bulletin 11-2, identified as a buyers' guide to bars, structurals, plates, sheets, and strip, and other basic steel products. Data is given on standard specifications to which these steels are made; type, range, and accuracy of cutting to users' needs; and opportunities to save by combining orders for these products.12

CENTRIFUGAL WET-DUST COLLECTOR—Pangborn Corporation, Hagerstown, Md. Bulletin 919, containing 4 pages describing the Type "CW-1" centrifugal wet-dust collector. Five photographs, three line drawings, and two tables give complete data on the counter-current wet collector of tower construction. The action of the patented vanes in dispersing the liquid to obtain greater capacity in reduced space is described.13

COUPLINGS—Smith & Serrell, Inc., Newark, N. J. Bulletin 53, providing useful data for proper specifications of the recommended coupling size for a range of motor drives from 1/4 H.P. at 600 R.P.M. to 250 H.P. at 3600 R.P.M. Order information includes a handy formula for proper selection of the correct flexible coupling size, based on user's service conditions and motor drive. 14

CURRENT CONTROLLER—Conoflow Corporation, Philadelphia, Pa. Bulletin EB-1, containing 4 pages describing the Model EB current controller, a pneumatic-electric transducer which provides

automatic control of current input required in many types of industrial operations and processes. In addition to showing operating features, the booklet illustrates some typical examples of industrial applications.15

REMOTE CONTROL FOR ARC-WELDING MACHINES—Worthington Corporation, Harrison, N. J. Bulletin R-1700-B17, offering information on "Arctrol," the portable, remote control for arc-welding machines. Data is given on simplicity of operation, details of construction, and installations. Also included is a parts and price list and a photograph illustrating the component parts.16

WISE—Producto Machine Co., Bridgeport, Conn. Bulletin TE2-104 giving information on a heavy-duty, 6-inch machine-shop vise, designed to take years of hard usage. It is available with swivel, complete with graduated base; plain, with clamping ears for swivel; or plain, with ground sides. Pictures of all three types, information on attachments, and complete specifications are included.17

CURRENT-LIMITING FUSES—General Electric Co., Schenectady, N. Y. Bulletin GEA-6319 containing 8 pages on current-limiting fuses rated 250 and 600 volts and in sizes from 6 to 200 amperes. Also given are specifications, curves of current-limiting characteristics, tables of maximum rating for conductors, melting times, and minimum backup, as well as table of dimensions.18

DESIGN MANUAL FOR HIGH-STRENGTH STEELS—U. S. Steel Corporation, Pittsburgh, Pa. 174-page practical handbook containing technical informa-

tion needed by an engineer in applying the use of high-strength low-alloy steels. It contains numerous charts and formulas for high strength steels, and also for structural carbon steel, and can be used as a multi-purpose design manual. ..19

DIRECT-CURRENT WELDERS—Vickers Electric Division, Vickers, Inc., St. Louis, Mo. Bulletin containing full details on the new control-arc magnetic amplifier-rectifier DC welder, and including details on the benefits, construction and operation features, performance charts, electrical specifications and ratings, dimensions and weights, and optional accessory equipment.20

INSTRUMENT TOOL STANDARDIZATION—Von Industries, Inc., Williston Park, N. Y. 24-page catalogue and price list giving the complete line of stainless-steel jig and fixture components for instrument tooling. Included are clamps, swivel studs, jig legs, jig buttons, heel pins, knurled thumb screws and nuts, and standard wood tool-storage boxes. 21

HIGH-PRESSURE REDUCING VALVE—A. W. Cash Co., Decatur, Ill. Bulletin S-731, featuring the company's Type 345 high-pressure reducing and regulating valve and containing recommended uses, description of construction and operation features, capacity, rating and sizing charts, photographs, and a cross-sectional engineering drawing.22

SLIDING-HEAD DRILLS—Cincinnati Lathe & Tool Co., Cincinnati, Ohio. Catalogue D-138, describing 16-inch sliding-head box-column drills, and giving information on their new geared power-feed electrical controls, speed changes, direct drives, standards of accuracy, full floating spindles, depth dials, box columns and frames, and bases.23

CYLINDRICAL-PLUG AND THREAD-PLUG GAGES—Sossner Tap & Tool Corporation, Lynbrook, N. Y. Brochure describing and illustrating the company's line of Taperlock, Trilock and Wire type cylindrical-plug gages and thread-plug gages. Size range, tolerances, handle sizes, member lengths, and thread pitches are included.24

MAGNETIC FIXTURES—O. S. Walker Co., Inc., Worcester, Mass. Leaflet describing line of magnetic fixtures, a combination of jig and fixture embodying magnetic characteristics. The new device simplifies work-holding with uniform results. Fixtures of this nature are used in mass-production industries.25

DEBURRING AND CHAMFERING MACHINES—Modern Industrial Engineering Co., Detroit, Mich. Bulletin 103-100, describing production of hypoid-pinion deburring and chamfering machines. Quick tooling changes are discussed and prelocated fixtures that enable satisfactory pinions to be produced with the first cut without tryout cuts.26

HIGH-STRENGTH STEELS—Republic Steel Corporation, Cleveland, Ohio. Leaflet ADV-668, giving data, including chemical compositions, mechanical properties, fabricating practice for cold-forming, and rolling limits and applications on weight-saving "50" high-strength steel, formerly designated as Republic double-strength steel.27

DETERGENT—Oakite Products, Inc., New York City. Folder describing the company's Rustripper, an alkaline detergent that removes rust, grease, and

Product Information Service

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certain types of paint at the same time. This material is also used in reconditioning steel and in maintenance and organic finishing operations.28

FEED AND SPEED CALCULATOR—Wiley's Carbide Tool Co., Detroit, Mich. Slide type calculator providing ready answers to carbide tool users for recommended feeds and speeds. This pocket size calculator is, in fact, a carbide machining handbook which measures 4 inches high and 9 1/4 inches long. .29

GEAR MANUAL—Philadelphia Gear Works, Inc., Philadelphia, Pa. Catalogue G-655 containing 76 pages of illustrations, diagrams, definitions, tables, charts, and explanations regarding many kinds of gears. There is also presented a simplified method of calculating horsepower ratings of all types of gearing. .30

DOUBLE-PLATE GEARED MOTORS—Barber-Colman Co., Rockford, Ill. Bulletin F-6841, 4 page leaflet giving data on a new open type geared motor, designed for overhanging or radial thrust loads. A wide selection of base motors is described—synchronous or non-synchronous, unidirectional, or non-synchronous reversible.31

SELECTION, FABRICATION, AND APPLICATION OF STEELS—Allegheny Ludlum Steel Corporation, Pittsburgh, Pa. 16-page folder listing the company's eighty-five current technical data sheets and booklets. Stainless, electrical, tool and die steels, and other high-alloy specialties are covered.32

ROLL-THREAD SNAP GAGES—Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn. 12-page catalogue describing and illustrating the company's roll-thread snap gages including open-faced and closed-faced styles. Illustrations, specifications, dimensions, and conditions are illustrated.33

MECHANICAL PRESSURE GAGE—W. C. Dillon & Co., Inc., Van Nuys, Calif. Bulletin PG-4, containing data on a pressure gage designed to measure mechanical pressure or compressive loads in very limited space. It may be used alone or can be incorporated directly in special testing devices.34

NEEDLE BEARINGS—Torrington Co., Torrington, Conn. Catalogue 55, presenting design, application, and use data for five types of needle bearings distributed by the company. The pages are illustrated with photographs and cross-sectional drawings from actual applications.35

SPEED CHANGERS—Allis-Chalmers Mfg. Co., Milwaukee, Wis. Bulletin 20B6013D describing operating advantages of Vari-Pitch speed changers and including arrangement diagrams, a selection table showing recommended unit size for standard motors, and a speed-range table of speed changers.36

STORAGE EQUIPMENT—Frick-Gallagher Mfg. Co., Wellston, Ohio. Catalogue 702, containing 16 pages on time-saving storage equipment. Described are racks, pins, shelves, and pallet frames for more efficient, more orderly storage of countless materials. More than 120 models are illustrated.37

AIR-COOLED COMPRESSOR—Ingersoll-Rand Co., New York City. Bulletin 1540, giving details on Model 20T compressor equipped with the Ingersoll-Rand channel

valve. The compressor may either be direct-connected or belt-driven. Cutaway views and a table of specifications are included.38

SPEED REDUCERS—Foote Brothers Gear & Machine Corporation, Chicago, Ill. 40-page booklet giving complete engineering data and specifications for all models in the new "Line-O-Power" speed reducers with capacities ranging from fractional horsepower to 150 H.P.39

GASKET - MOUNTED HYDRAULIC VALVES—Petch Mfg. Co., Philadelphia, Pa. Bulletin H55, giving complete engineering data and specifications on the Hupp threadless sub-plate for gasket-mounted hydraulic valves. Illustrations, specifications, and diagrams are included.40

SWEDISH LATHES AND MILLING MACHINES—Homstrand, Inc., Larchmont, N. Y. 20-page illustrated catalogue describing the entire line of Swedish-built Koping lathes and milling machines, as well as giving a pictorial description of the ninety-seven-year old firm in Sweden.41

LEVERS AND CONTROL UNITS—Batavia Metal Products Corporation, Batavia, N. Y. Bulletin HW-B3, presenting in 16 pages the company's extensive line of levers and control units. A photographic chart is included to show how special levers are assembled from standard forgings.42

PRECISION SPINDLES—Standard Electrical Tool Co., Cincinnati, Ohio. Catalogue 20, containing 56 pages on the company's precision spindles for grinding, boring, drilling, and routing work-heads. Dimensions, tables, and illustrations are given.43

SPOT-WELDING MACHINE—Sciaky Bros., Inc., Chicago, Ill. Bulletin 334-3, featuring the company's air-operated, three-phase, Modu-Wave press type spot-welder. Known as the PMCO 2 ST, this welder is one of a series of sizes ranging from 0 ST through 7 ST.44

PLATE AND PLATFORM MOUNTING—Western Mfg. Co., Detroit, Mich. Catalogue describing four different standard models for plating and platform mounting which range in capacities from 1 to

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30 H.P. and with as many as eight speed changes and gear ratios up to 6 to 1. .45

CEMENTED CARBIDE MATERIALS—Kennametal, Inc., Latrobe, Pa. Booklet describing cemented carbide products of the company and their applications, characteristics, and grades. Mechanical and physical properties of Kennametal and Kentanium are also outlined. .46

DRILL BUSHINGS—Hi-Shear Rivet Tool Co., Los Angeles, Calif. Catalogue offering information on how to use anchor bushings in sheet metal and plastics in addition to giving bushing data. The latest epoxy-resin techniques are included. .47

POWER DRIVE—General Mfg. Co., Detroit, Mich. Leaflet describing the company's flexible power press with new air-controlled clutch and explaining how maximum power can be pre-set if desired. Illustrations and specifications are given. .48

COOLANT PUMPS—Graymills Corporation, Chicago, Ill. Booklet K363, giving complete information on coolant, circulating, and agitating pumps. Illustrations, photos, performance index, diagrams, dimensions, and special available models are included. .49

TURRET PUNCH PRESS—Wiedemann Machine Co., Philadelphia, Pa. Bulletin 61, containing 16 pages describing the R-61 heavy-duty turret punch press and explaining its many features. Illustrations, diagrams, and lay-outs are included. .50

FASTENERS—Allmetal Screw Products Co., Inc., Garden City, N. Y. 8-page brochure describing stainless fastener styles and sizes. Included are illustrations of screws, bolts, nuts, washers, rivets, "AN" fasteners, nails, and pins. .51

WIRE BRUSHING AND GRINDING UNITS—Standard Electrical Tool Co., Cincinnati, Ohio. Catalogue 20, covering wire brushing and grinding units and detailed information on their use in production equipment. .52

MAGNETIC STORAGE DEVICES—Brush Electronics Co., Cleveland, Ohio. Folder discussing the TapeDRUM, a magnetic storage device, which combines magnetic drum and tape recorder. .53

THREAD INSERTS—Heli-Coil Corporation, Danbury, Conn. Bulletin 724A, containing data on the company's thread inserts which are precision-formed coils of stainless-steel diamond-shaped wire. Uses, advantages, and dimensions are given on these inserts for thread repair. .54

MAGNETIC CHUCKS—O. S. Walker Co., Inc., Worcester, Mass. General catalogue giving data on rectangular, swivel, rotary, and magnetic chucks; vacuum chucks; demagnetizers; planer parallels; and a new line of lifting magnets. .55

BALANCED-ACTION GAGES—Winter Bros. Co., Rochester, Mich. Catalogue 2G, containing 33 pages on the company's balanced-action threaded and cylindrical plug and ring gages, and showing current net prices on all stock items. Illustrations and specifications are given. .56

QUENCHING OIL—Sun Oil Co., Philadelphia, Pa. Bulletin 37, describing low-cost quenching oils and including a table showing the advantages of various degrees of oil agitation. .57

MECHANICAL TOOL-HOLDERS—Newcomer Products, Inc., Latrobe, Pa. Leaflet describing Nu-Tool mechanical tool-holders used with "Throwway" type carbide inserts. Prices, specifications, and features are given. .58

CONTROL VALVES—Versa Products Co., Inc., Brooklyn, N. Y. Catalogue describing in detail over 40,000 hydraulic and pneumatic valves manufactured by the company. .59

PRECISION BORING HEADS—Maxwell Co., Bedford, Ohio, 6-page catalogue on precision boring and power-facing heads. Details of features are given, and charts provide dimensions. .60

SNAP-RING BEARINGS—Marlin-Rockwell Corporation, Jamestown, N. Y. Leaflet describing snap-ring bearings and giving groove, snap-ring, and housing dimensions. .61

AIR-OPERATED CLUTCH—Ferracut Machine Co., Bridgeton, N. J. Bulletin 5008, giving maintenance instructions for "LK" air-operated clutch and interconnected Flex-Disc brake with single-point adjustment. .62

COLD EXTRUSIONS—Koldflo Division, Mullins Mfg. Corporation, Warren, Ohio. Bulletin 5134R, second edition, describing and illustrating the design of various parts made by Koldflo extrusions. .63

STRAIGHT SIDE PRESSES—Ferracut Machine Co., Bridgeton, N. J. Catalogue containing 6 pages of information on double-crank, straight-side presses, including specifications and illustrations. .64

UNIT HEATERS—L. J. Wing Mfg. Co., Linden, N. J. Bulletin HA-1, describing Wing revolving units and listing the advantages of using them for heating aircraft hangars. .65

COMPARATOR CHARTS—Vanguard Instrument Corporation, Valley Stream, N. Y. Brochure describing chart service for optical comparators. Several typical case figures are given. .66

STAINLESS-STEEL VALVES—Cooper Alloy Corporation, Hillside, N. J. Catalogue 55, covering 12 pages of stainless-steel valve design, selection, maintenance, and repair. .67

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We put Hydraulic Cylinders on a reducing diet



RESULT:

The New VICKERS®
"Compact"
HYDRAULIC CYLINDERS

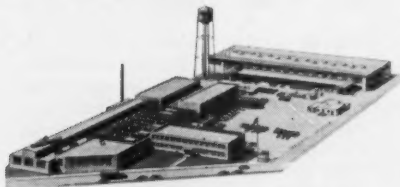


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Working Pressure**

Everybody agreed that hydraulic cylinders were just too fat . . . took up too much space. So our engineers put them on a reducing diet. The result . . . these slim, powerful, "Compact" cylinders fit and work in spaces where the old type could not. It is part of Vickers long-time program of continuous improvement.

Among their many other features are: Multiple port positions. Spring-loaded synthetic-impregnated leather rod seal compensates for wear, assures long service. Piston seals are improved cup type. Tie rods are high tensile alloy steel. Adjustable integral hydraulic cushions are available. Comply with JIC standards. Conservatively rated for maximum working pressure of 2,000 psi. For further information, see Bulletin 54-68.

Waterbury Tool Division of Vickers Incorporated
where "Compact" Cylinders are manufactured.



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6950

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

For more information on products advertised, use Inquiry Card, page 245

MACHINERY, August, 1955—249

Washington, D.C., Louisiana, and Alabama

CHARLES W. STEWART, JR. was elected president of the Machinery and Allied Products Institute, Washington, D. C. He will also serve as chairman of the Council for Technological Advancement.

JOHN A. O'REILLY has been named district sales manager for DeWalt, Inc., Lancaster, Pa. Mr. O'Reilly's territory will consist of the states of Alabama, Arkansas, Louisiana, Mississippi, and part of Florida. His headquarters will be in New Orleans.

GEORGE H. COMPTER, assistant to the vice-president and secretary of Ford Instrument Co., division of the Sperry Corporation, Long Island, N. Y., has been appointed consultant to Electrical Equipment Division, Business and Defense Services Administration, United States Department of Commerce.

GIDDINGS & LEWIS MACHINE TOOL Co., Fond du Lac, Wis., has appointed the DIXIE MILL SUPPLY Co., INC., New Orleans, La., as its New Orleans area representative.

WILLIAM L. MORRIS has been appointed Birmingham, Ala., sales representative for the A. Milne & Co., New York City. His headquarters are at 1727 Sixth Ave. N., Birmingham, Ala.

Wisconsin, Washington, and Minnesota

WARNER ELECTRIC BRAKE & CLUTCH Co., Beloit, Wis., has appointed two new vice-presidents. NORMAN K. ANDERSON, formerly general sales manager, has been

named vice-president of sales, and KING DESEVE, formerly manager of manufacturing, has been made vice-president of operations.

KEARNEY & TRECKER CORPORATION, Milwaukee, Wis., announces the following appointments: HENRY H. LENTZNER has been made vice-president in charge of manufacturing. He succeeds RALPH W. BURK, who was named executive vice-president last month; RENEAL F. ZEMKE has been named works manager of the standard machine division; and JOHN P. BUNCE staff assistant to the manufacturing vice-president.

HOMER R. BROWN has been appointed sales manager—Milwaukee, Wis., steel service plant of Joseph T. Ryerson & Son, Inc., Chicago, Ill. Mr. Brown became associated with Ryerson in 1930 in a sales capacity.

EKSTROM, CARLSON & Co., Rockford, Ill., recently named the Tyee Machinery Co., 1924 First St., South Seattle, Wash., as its representative in Washington, Idaho, and Montana. NEAL WARNE and LLOYD EVANS are sales representatives for its complete line of metal-working and woodworking machinery and tools.

MASON N. LEASE has been appointed as field engineer in Minneapolis, Minn., for the Warner & Swasey Co., Cleveland, Ohio. Mr. Lease will make his headquarters at a branch sales office the company is opening at 400 W. 66th St. in Minneapolis.

* * *

A new one-piece casting will eliminate 55 stampings and 1639 fasteners in conventional landing-gear door construction, resulting in an estimated savings of \$1060 per plane.



(Left) Norman K. Anderson, vice-president of sales; (Right) King DeSeve vice-president of operations of Warner Electric Brake & Clutch Co.

Obituaries

ROY L. DEBRAUWERE, assistant vice-president of Scovill Mfg. Co., Inc., Waterbury, Conn., and assistant general manager of the Schrader Division of the company, died suddenly on June 18th at his home in Lynbrook, N. Y. Mr. deBrauwere started with the company over forty years ago and held various executive offices.

ARTHUR L. BUSHMAN, assistant manager of the New York branch sales office of the Crucible Steel Company of America, Pittsburgh, Pa., died on June 10. Mr. Bushman was an employee of the company for more than twenty-five years.

Coming Events

SEPTEMBER 6-17—Machine Tool Show sponsored by the NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION to be held at the International Amphitheatre, Chicago, Ill. Further information can be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

SEPTEMBER 6-17—PRODUCTION ENGINEERING SHOW, coinciding with the Machine Tool Show, to be held at the Navy Pier, Chicago, Ill. For further information, write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

SEPTEMBER 6-17—METALWORKING MACHINERY AND EQUIPMENT EXPOSITION to be held at the Coliseum, Chicago, Ill. Further information can be obtained from Chester L. Wells, general manager, 2689 East Overlook Road, Cleveland 6, Ohio.

OCTOBER 23-26 — Semi-annual meeting, AMERICAN GEAR MANUFACTURERS ASSOCIATION at the Edgewater Beach Hotel, Chicago, Ill.

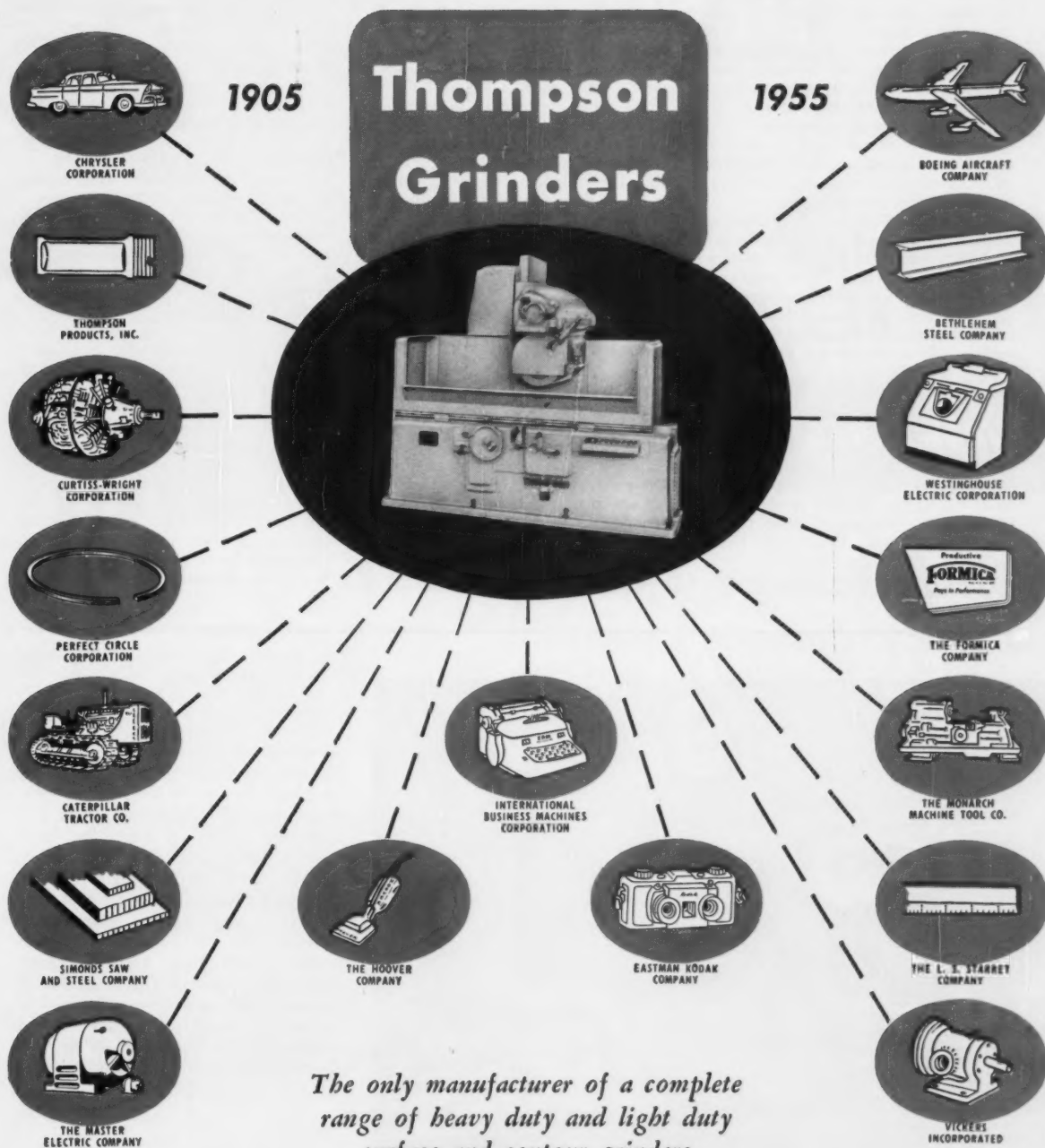
* * *

Free Lubricants, Coolants, and Cleaners for Machine Tool Exhibitors

Free service, including the installation of cutting fluids, lubricants, and hydraulic fluids in operating equipment, and metal cleaners and rust preventives for machines, tools, gages, spare parts, and production work-pieces, will be offered by E. F. Houghton & Co., Philadelphia, Pa., to all exhibitors at the Machine Tool Show. To provide this service during set-up time, the Houghton booth will be open early in August, one month ahead of the opening date of the Show. Houghton service engineers will be on duty during July and August, and at the Show.

Quality Speaks

among the thousands of users of



THE THOMPSON GRINDER COMPANY, SPRINGFIELD, OHIO

New Books and Publications

ELEMENTS OF MACHINE DESIGN. By Emanuel Rosenthal and George P. Bischof, 5 3/4 by 9 inches. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, \$4.50.

The theory of machine design has been simplified in this text to meet the needs of students in technical institutes, technical high schools, and trade schools. Beginning with a survey of the metals of industry and their properties, the authors then discuss problems in applied mechanics, power transmissions, and design stresses for dynamic loadings. The main portion of the book is devoted to the design of principal machine parts, such as shafts, keys, gears, couplings, bearings, pulleys, clutches, and springs. The text is based on posing a problem for a particular topic, analyzing it, and presenting a solution. More than 230 problems are outlined. Chapter headings are as follows: The Work of the Machine Designer; Properties of Materials; Metals of Industry; General Problems of Force and Motion; Force and Motion as Applied to Simple Machines; Design Stress and Dynamic Loading; Power and Power Transmission; Shafts in Torsion Only; Shafts in Bending and Torsion; Elastic Deformation in Shafts; Keys; Pulleys and Belts; Gears and Friction wheels; Couplings; Bearings; Clutches; Thin-walled Cylinders—Welded and Riveted Joints; Screws, Fastenings,

and Seals; Springs; Combined Stresses; and Fits, Allowances, and Tolerances.

BASIC LUBRICATION PRACTICE. By Allen F. Brewer. 286 pages, 6 by 9 inches. Published by the Reinhold Publishing Corporation, 430 Park Ave., New York City. Price, \$6.75.

Various phases of lubrication practice are covered in this reference work by the former editor of "Lubrication" magazine.

The book opens with a discussion of the operating conditions affecting lubrication and the physical tests of petroleum lubricants and their significance. Various types of bearings are then described and the methods used for lubricating them. Machine elements such as gears, chains, and flexible couplings are covered and the special requirements of such prime movers as internal combustion engines, steam turbines, and electric motors are discussed. A chapter on non-petroleum lubricants is included.

The author has written for the machine designer as well as for the maintenance man as indicated by the first paragraph of his preface in which he says, "Designing for lubrication is as important as designing for production. In fact, unless the former is effectual and contributes to dependable operation at minimum cost for maintenance the production line will suffer, regardless of the products."

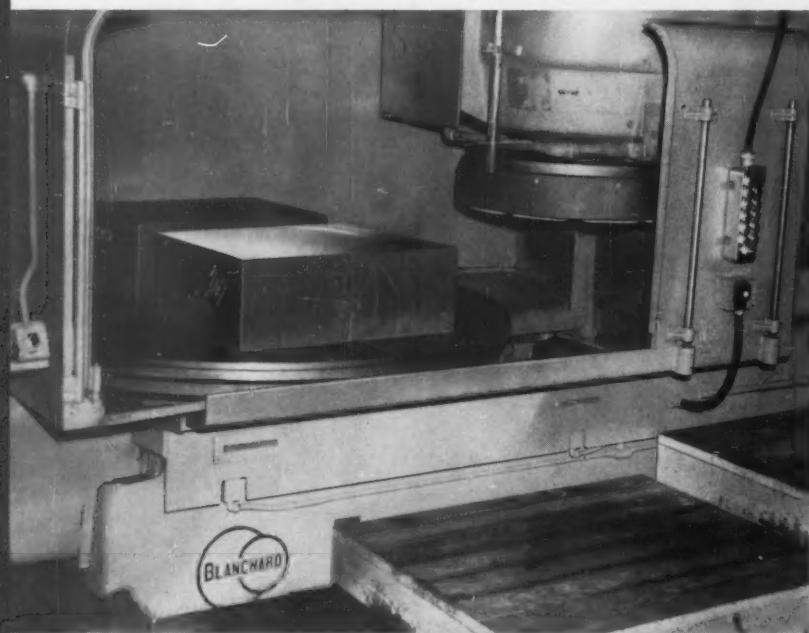
Spring Production Facilities Expanded

A \$13,000,000 plant expansion and equipment modernization program, initiated at the close of World War II, has been carried out by Associated Spring Corporation, Bristol, Conn. More than \$4,500,000 of this amount has been devoted to the corporation's three Bristol divisions, Wallace Barnes Co., Dunbar Bros. Co., and F. N. Manross & Sons Co.

Supplying precision mechanical springs and other metal components to a varied industrial field demands diversification of production facilities. Some interesting operations performed at the several divisions of the corporation are automatic coiling of compression and extension springs; multiple-slide forming of intricate lock springs and snap-rings; precision coiling of hair-springs for instruments and other delicate mechanisms; forming tuner coils for television receivers; coiling of automotive and aircraft starter springs; and continuous cold-rolling of high-carbon steel.

Heavy-duty rolling of spring-grade steel is done on a United "four-high" mill. Seven passes at a speed of 750 feet per minute are required to bring some steel coils down to size. Each of two consoles control the rolling operation in one direction only.

Cold-rolling of spring steel is followed by slitting into coils of desired width. Extensive edge-finishing facilities provide for the removal of burrs and knife edges from the narrow strip of stock.



A new Blanchard surface grinder now performs the initial machining on large die-blocks in the die shop of the Wyman-Gordon Co., Worcester, Mass. The operation consists of truing the faces of the blocks in preparation for die layout. Grinding has been showing an average timesaving of 75 per cent over previous truing methods. The rotary work-table of the machine is a one-piece, 84-inch steel magnetic chuck which has a working surface of 72 inches. A 42-inch segmented wheel is carried by the 100-H.P. direct-driven spindle. The die-blocks will be used on drop-hammers to produce aircraft forgings.

CLEAR

COOL

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TRIPLE C GRINDING
COOLANT**

by **MOTCH & MERRYWEATHER**

in either liquid or crystalline form

CLEAR. Triple C solutions are transparent and stable. You can watch the progress of your work. You will experience no foaming. With Triple C there is no emulsifying action on hydraulic or lubricating oils.

COOL. Uniform, complete wetting of metal provides maximum cooling. No steam or smoke; quicker, cooler, safer handling of work-pieces by your operator... *Results:* increased accuracy and higher production.

CLEAN. Grinding wheels stay clean and free-cutting. Fewer dressings reduce wheel cost. Clean machines remain free of caked residue. Triple C on floors and clothing dries without residue or odor. Filters do not clog.

The exceptional advantages of Triple C Grinding Coolant are available in either liquid or crystalline form. Triple C is the only coolant intended primarily for wet grinding which offers this option . . . Where shipping costs and storage space are not prime considerations, *Liquid Triple C* is frequently specified. Moreover, *Liquid Triple C* affords extra protection against rust and grinding odors . . . *Crystalline Triple C* saves space. Readily soluble, it possesses the clear, cool, clean qualities which are so desirable in a grinding coolant.

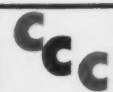
— Your M & M dealer stocks Triple C Grinding Coolant. —

THE MOTCH & MERRYWEATHER MACHINERY CO.

CUTTING TOOL MANUFACTURING DIVISION

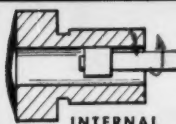
CLEVELAND 17, OHIO

for results you can see . . . **TRIPLE**

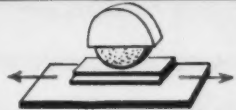


*TRADE MARK

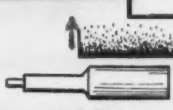
FOR ALL WET GRINDING



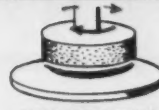
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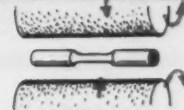
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EXTERNAL



FLAT ROTATING



CENTERLESS

TRIPLE C BRINGS A CLEAN DEAL TO YOUR MACHINES, OPERATORS, AND SHOP

It's New!



A NO IMPACT HOLDDOWN SYSTEM

FOR SHEARS

The Lodge & Shipley "No Impact" holddown system means *no mars, no dents, no holddown clatter* . . . and you still get positive holding power for accurate cutting, unsurpassed by any shear!

With the new Lodge & Shipley holddown system eliminating impact *and* damage, you can now shear the softest, most highly polished metals without impact mar. This "soft touch with terrific holding power" is a Lodge & Shipley exclusive!

Also available, for standard shearing, is the proven Hydro-Hold holddown system which offers positive, fast acting operation!

ASK ABOUT IT at The Machine Tool Show—Lodge & Shipley Booth 502. Also, be sure to see the All-New Shear and Press Brake.

In Shears, Too . . . Your Lodge-ical Choice

Lodge & Shipley

Hamilton Division
Hamilton 1, Ohio

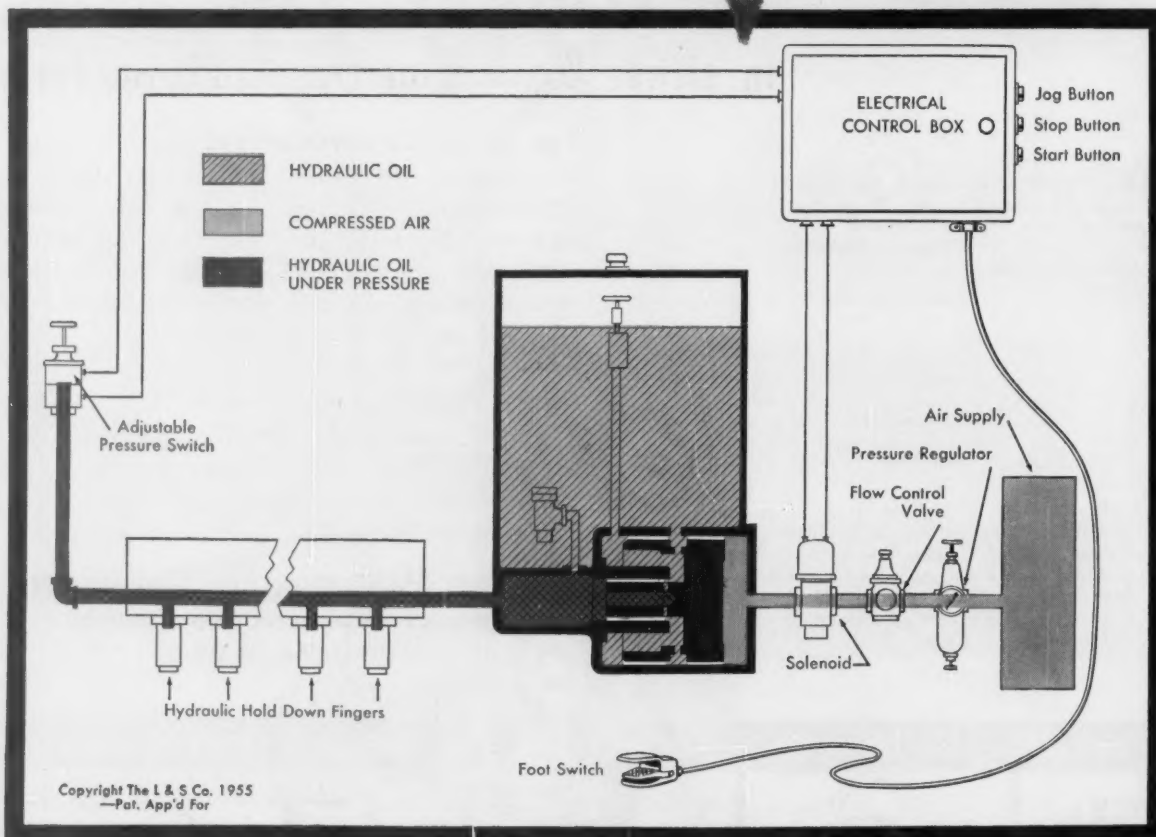
NOW . . . and exclusively from Lodge & Shipley . . . you can choose a shear with a holddown system perfectly suited to your shearing requirements.

"THE SOFT TOUCH WITH TERRIFIC HOLDING POWER"



There's no impact, no damage, no noise, when the holddown lightly touches, then . . .

Tons of holding pressure are developed, before the blade starts to cut!



TRIPLE C BRINGS A CLEAN DEAL TO YOUR MACHINES, OPERATORS, AND SHOP

THE MACHINE TOOL SHOW

SEPTEMBER 6-17, 1955
INTERNATIONAL AMPHITHEATRE
CHICAGO, ILL.



24,412* production executives
in search of lower costs!

They'll find them (and you'll find them, too) at the Machine Tool Show. More than ninety per cent of the country's leading machine tool builders will be there, ready to demonstrate to you their newest models, their fastest, most ingenious cost-cutting metalworking methods.

The machine tool accessory manufacturers will be in Chicago, too—and you're invited to attend their Production Engineering Show, on the Navy Pier. Your Machine Tool Show badge is good at both shows.

Plan now to be on hand. The 1955 Machine Tool Show is the best chance you've ever had to see the world's best investment—in action!

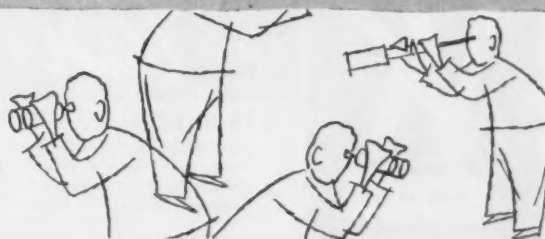
NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION

2071 East 102 Street • Cleveland 6, Ohio

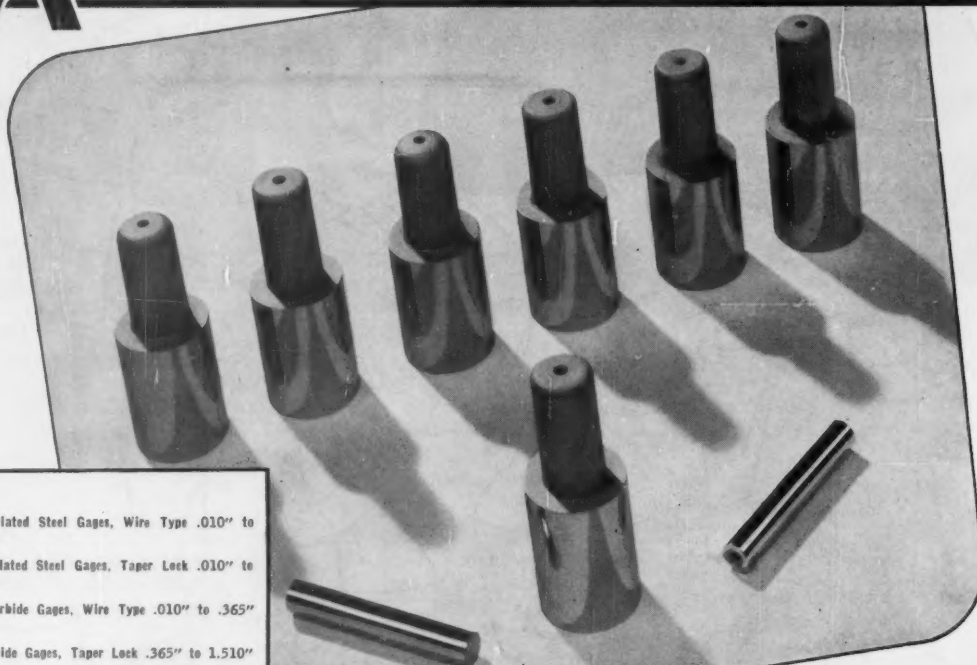
THE
MACHINE TOOL
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SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE



* Estimated Attendance,
Before Receiving Your Reservation



VK PLAIN PLUG GAGES *class xxx!!*



Chromium Plated Steel Gages, Wire Type .010" to 1.010" dia.

Chromium Plated Steel Gages, Taper Lock .010" to 1.510" dia.

Tungsten Carbide Gages, Wire Type .010" to .365" dia.

Chrome Carbide Gages, Taper Lock .365" to 1.510" dia.

*Now available for
fine inspection requirements*

In response to persistent demand, VK has developed and now announces a new, ultra-fine, plain plug gage tolerance of .0001", designated as Class XXX. This new tolerance, half of that of Class XX, satisfies a need, long evident, for gages to meet part limits finer than .0002", and permitting only ten millionths of an inch total variation on the gage in sizes up to .825" diameter, and only fifteen millionths in sizes from .825" to 1.510" diameter. Tolerance may be applied either bilaterally or unilaterally.

Inasmuch as Class XXX tolerance must take into account such factors as

finer diameter variation, a high order of roundness control, an exceptional surface finish and an extreme resistance to wear (all of which offset the shallow wear depth inherent in such a gage class), Class XXX is offered in only Chromium Plated and Carbide Gages.

VK Class XXX Plain Plug Gages are furnished in the materials, styles and ranges shown in boxed panel above. VK also furnishes Class XX, X, Y, and Z standard tolerance plug gages in wire type, taper lock and trilock designs. For complete information address: The Van Keuren Company, 178 Waltham St., Watertown, Mass.

"Quality in Millionths"



THE *Van Keuren* CO.,

178 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carbide Cemented Carbide Plug Gages • Carbide Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages



NEW

BRYANT air sizing...



Bryant #2209-Y Automatic Internal Grinder equipped with Bryant Air Sizing for automatic size control of bores



Be sure to see Bryant at the
Machine Tool Show, Booth 1015

BRYANT

holds closer tolerances in internal grinding than any other sizing method!

This new method of sizing is designed especially for automatic production. It's extremely accurate, time-saving and economical—ideal for straight hole grinding when high-speed production, close tolerances and fine finishes are desired.

Bryant Air Sizing utilizes three principal operating components: Air Gage Panel, Bryant Impulse Timer and the Air Plug.

The Air Plug is mounted through the workhead and traverses continuously into the workpiece during the finish grinding cycle. Oscillation is timed and controlled from the wheelslide.

The Air Gage Panel measures the pressure peaks which occur at the air plug orifices each time the Air Plug enters the workpiece. These pressure peaks are multiplied to make gaging faster and more sensitive, and are then converted from pressure values into electrical impulses which operate the Bryant Impulse Timer.

The Timer continues the grinding cycle until the impulse signals stop, indicating that size has been reached. It then stops the grinding cycle and initiates the automatic loading cycle.

Bryant Air Sizing controls the size of workpieces *during the finish grinding cycle*. There is no contact between the gaging element and the workpiece. As a result, wear of the gaging element and possible scoring of the workpiece is eliminated.

Diamond sizing is used with Bryant Air Sizing to control size during the rough grind operation. *Write for descriptive literature.*

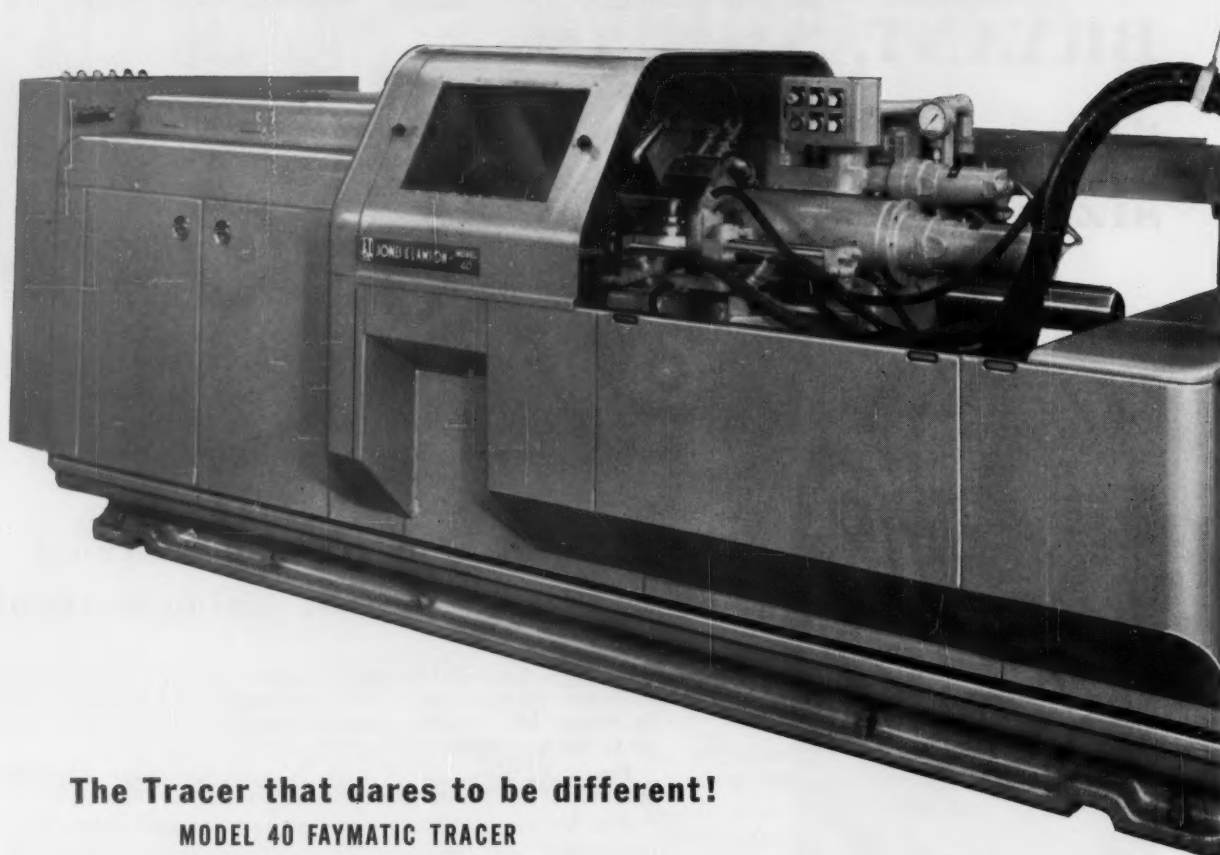
chucking grinder co.

20 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia
Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

Here's what you have been asking for . . .

A HEAVY DUTY automatic sequential* TRACING LATHE...



The Tracer that dares to be different!

MODEL 40 FAYMATIC TRACER

REDUCES Tooling Costs — Set-Up Time — Handling . . . and is rugged enough to remove metal at modern High Velocities.

*** Can also be operated manually**

CAPACITIES FOR CARRIAGE

Distance between centers	36"	60"	96"
Maximum Turning Length	36"	48"	48"
Maximum Radial Facing Cut	4"	4"	4"
Tracing Turning Range — 1" dia. min. to 14" dia. max.			
Maximum Swing over Tracer Carriage — 15"			

CAPACITIES FOR BACK ARM

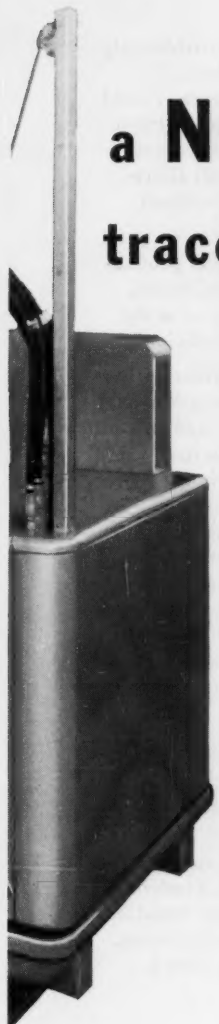
Maximum Radial Facing Cut — 3¼"	
Facing Range — 13¼" to 0"	



JONES & LAMSON MACHINE COMPANY

Jones & Lamson offers you a choice of methods for acquiring modern, profit-producing J & L equipment. In addition to outright purchase, J & L makes available several different "Pay-From-Productivity" plans at interest rates of 3¼ % and lower (add-on), and a broad variety of lease plans.

Send today for complete details on J & L's machines, methods and Procurement Plans. Simply fill in the coupon, clip it to your letterhead and mail.



a **NEW CONCEPT** of applying the tracer principle to a **TURNING MACHINE!**

- ✓ Handles $\frac{1}{2}$ " depth of cut on any of one to four automatically controlled tracing cuts.
- ✓ 12" back arm can be operated anytime during the carriage cycle for rough or finish facing cuts and for cutting grooves. Automatic tool relief on all finish cuts, both back arm and carriage.
- ✓ Two-position automatic indexing tool holder on tracing slide permits heavy roughing cuts with one tool and extremely accurate finishing cuts with another.
- ✓ Heavy Duty Headstock — 16 spindle speeds (through pick-off change gears) with automatic 2 to 1 or $2\frac{1}{2}$ to 1 speed change under cut.
- ✓ Feed and speed changes occur automatically during a cut, insuring optimum cutting speeds on changing diameters and angles, as well as permitting roughing at one speed and finishing at another.
- ✓ Four hydraulic flow control valves and three control drums operating electrical limit switches comprise the entire set-up for a great variety of combination cuts, feeds and speeds.
- ✓ Hydraulic power is an enclosed compact unit — an integral part of the machine. Electrical controls are grouped in one enclosure.
- ✓ 40 H. P. Motor



BOOTH NO. 1111

MACHINE TOOL DIVISION

512 Clinton St., Dept. 710, Springfield, Vt., U. S. A

UNIVERSAL TURRET LATHES • FAY AUTOMATIC LATHES • AUTOMATIC DOUBLE-END MILLING & CENTERING MACHINES • AUTOMATIC THREAD & FORM GRINDERS • OPTICAL COMPARATORS
AUTOMATIC OPENING THREADING DIES & CHASERS.

JONES & LAMSON MACHINE COMPANY
512 Clinton St., Dept. 710, Springfield, Vt.
U. S. A.

Please send me the J & L Machine Tool Replacement Information Kit.

Name _____

Title _____

Eliminates model change-over problems!

*a special production machine—
with standard units . . . quick
change-over features for
each year's design change.
completely automatic—
requires only part
loading and unloading.*

Morris Unit-Type Machine Tools provide truly specialized machining of your product . . . using standard production components . . . add flexibility to your high-speed mass production operations. They may also be re-aligned and additional drill units added for model alterations, or for complete new models, without scrapping the machine.

For example, the Morris MOR-SPEED production machine illustrated, drills, burs, reams, taps and spotfaces carburetor air horns at the rate of 375 pieces per hour at 80% efficiency!

Its standard basic construction provides a stationary circular center column with Morris AIR-OIL-MATIC Drill Units mounted on the column and on the removable platen for station operations. Parts are placed in air-power clamped fixture by the operator. The table indexes automatically through 12 stations, controlled by hydraulic indexing mechanism. 24 operations on 21 holes on 4 perpendicular faces and one angular face are performed on each piece. Operator merely loads unfinished pieces, unloads completed parts. Cams on center column automatically index and position fixtures at each station.

Morris AIR-OIL-MATIC Drill Units, mounted in vertical, horizontal or angular planes at the stations, provide accurate high-speed machining.

Easy Maintenance

Each drill unit is provided with independent feed and speed, permits adjustment of individual units without affecting entire machine. Standard units, stock parts, speed machine maintenance. Operational difficulties may be pin-pointed, given prompt attention.

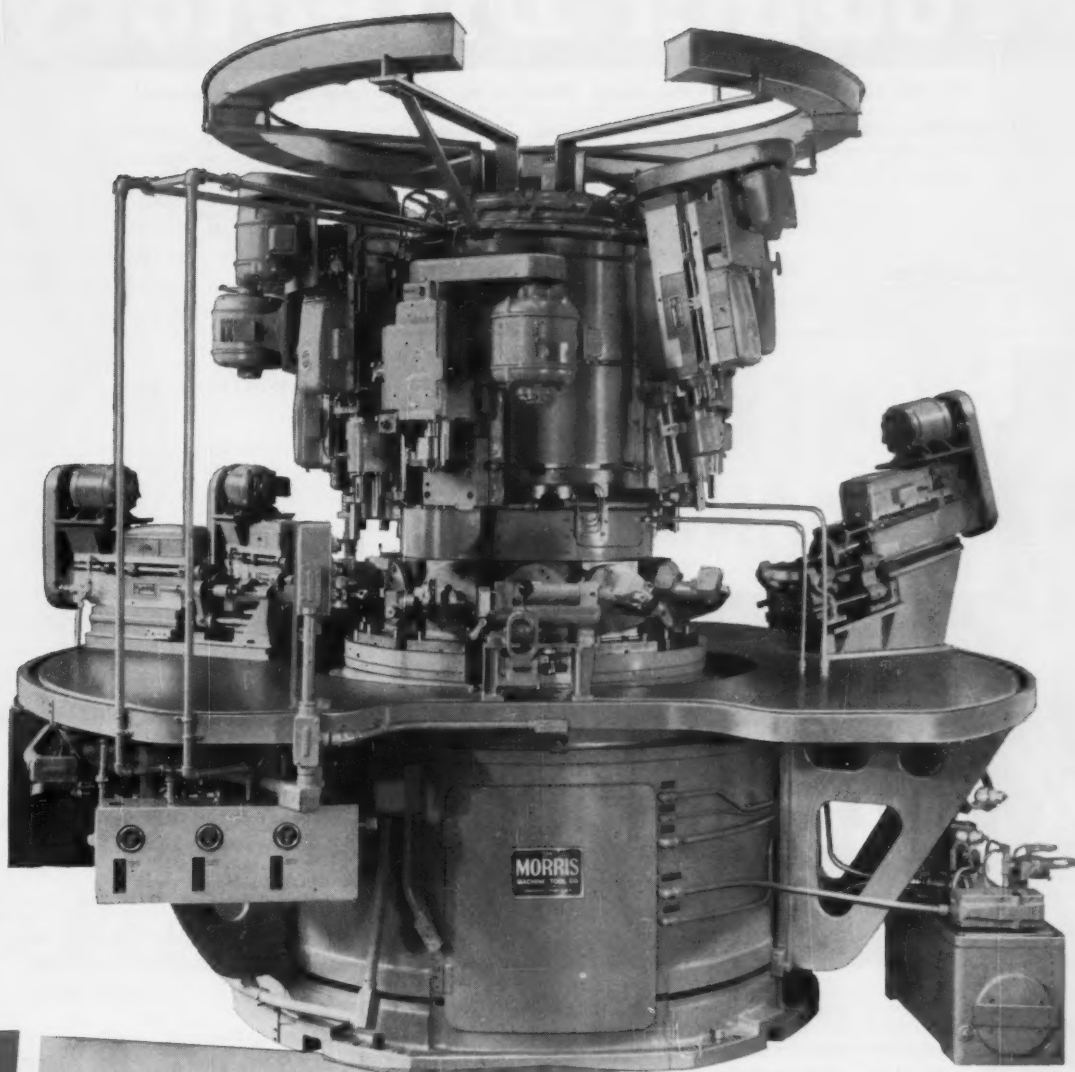
MORRIS AIR - OIL - MATIC DRILL UNITS

- Adjustable Feed, Stroke and Rapid Approach • Trouble-free Hydraulic System
- Wide Range of Spindle Speeds • Convenient Controls
- Air or Oil Powered • Hydraulically Controlled



A powerful package of precise versatility, developed by Morris, one of the nation's leading manufacturers of high production drilling machinery. Available for use in special purpose machines like the production machine illustrated.

AIR OR OIL POWERED—HYDRAULICALLY CONTROLLED!
Designed for a wide range of drilling, reaming, chamfering, spot-facing, hollow milling, centering and related operations, the unit can be mounted in vertical, angular or horizontal positions. The Morris AIR-OIL-MATIC Drill Unit has adjustable feed rate, feed stroke and total stroke. Controls and actuating devices can be set to provide almost any sequence of operations.



You'll want to know how MORRIS Unit Type Machine Tools, MORRIS AIR-OIL-MATIC Drill Units can be applied to solve your mass production involving multiple drilling, reaming, tapping and boring.

Write for detailed descriptive literature . . . or outline your production problem for prompt attention by Morris engineers.



**VISIT US AT BOOTH #912
THE MACHINE TOOL SHOW
Chicago, Illinois, Sept. 6-17, 1955
International Amphitheater**



Morris

THE MORRIS MACHINE TOOL CO.

946 HARRIET STREET . CINCINNATI 3, OHIO

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

ABRASIVES

See Discs, Abrasive

ABRASIVES, HONING

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

ABRASIVES, Polishing, Tumbling, Etc.

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Macklin Co., 2925 Wildwood Ave., Jackson, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic

American Steel Foundries, Elmes Engineering

Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.



A NEW CONCEPT!

MOHAWK

Size-Optional

SUBLAND

Believing that there is too great a void between standard and special tooling, Mohawk has designed and developed a semi-standard subland tool.

The Mohawk Size-Optional Subland is machined, hardened and placed in a stock bin. This results in a material saving to the customer in set-up costs, reduces delivery time to a fraction of that usually required for special tools, and allows a tremendous reduction in inventory. In ordering these Size-Optional Sublands, the customer is limited only in relation to shank specifications, and partially on overall length requirements. Diameters and step lengths are completely optional to fit the particular application. Write for full details.



SUBLAND DRILL (2-2)

(1) Drill—Chamfer
(2) Drill—Counterbore
(3) Drill—Drill

**NORMAL DELIVERY
1 WEEK
FROM RECEIPT OF ORDER**



910 E. MAIN ST., MONTPELIER, OHIO

world's largest producer of Sublands

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOY STEELS, High Temperature

Firth Sterling Inc., 3113 Forbes St., Pittsburgh

ALLOYS, Non-Ferrous

American Brass Co., 25 Broadway, New York
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ALLOYS, Zinc

New Jersey Zinc Co., 160 Front St., New York, N. Y.

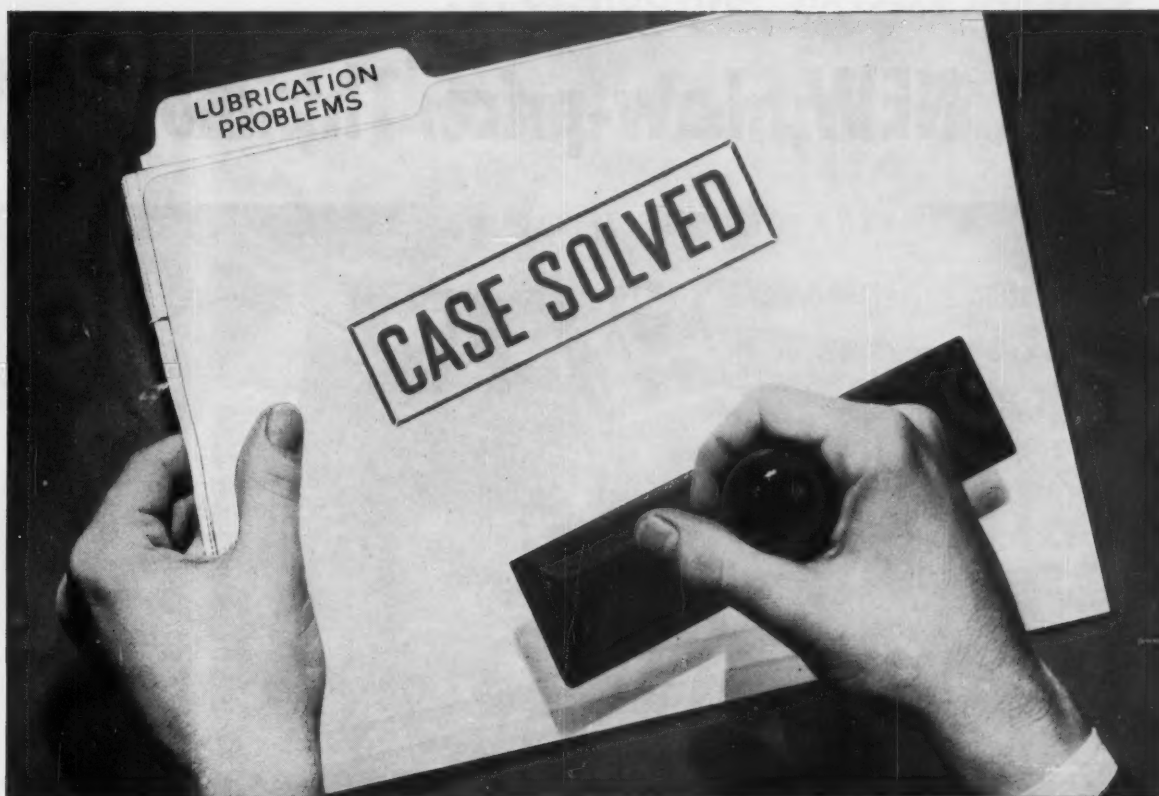
ARBOR PRESSES

See Presses, Arbor

ARBORS AND MANDRELS

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(Continued on page 266)



Vilter Mfg. Co. Solves 3 problems with Cities Service Lubricants

PROBLEM 1. Formation of carbon on air compressor valves, necessitating shut-down to clean every three months.

PROBLEM 2. Mixing of oil and water on valve gears and bearings of engine driving Vilter's 600 KWH generator. Constant draining required.

PROBLEM 3. Groaning of corliss steam valves on Vilter's condensing, cross-compound steam engine.

Since 1867, Vilter Manufacturing Company of Milwaukee has enjoyed the reputation of solving difficult engineering problems in refrigeration and air-conditioning. So it was natural that when Vilter had a lubrication problem, it would solve that also. Natural, too, that Cities Service Lubricants would be those chosen to carry out the task.

Says Vilter's Chief Power Plant Engineer, James Murphy: "The valves on our two-stage, high pres-

sure air compressor were coating with carbon so badly that we had to shut down and clean them every three months. Then we switched to Cities Service DC-300 Oil. Now, after nine months, valves are perfectly clean and our carbon problem is gone.

"At the same time we tried Cities Service Pace-maker No. 3 to stop a problem of oil mixing with water on the valve gears and bearings of the steam engine driving our 600 Kilowatt hour generator. The problem ceased and for more than nine months we haven't had to change the oil because it does not emulsify with water.

"We also silenced groaning from the corliss steam valves of this steam engine by switching to Cities Service Optimus No. 3."

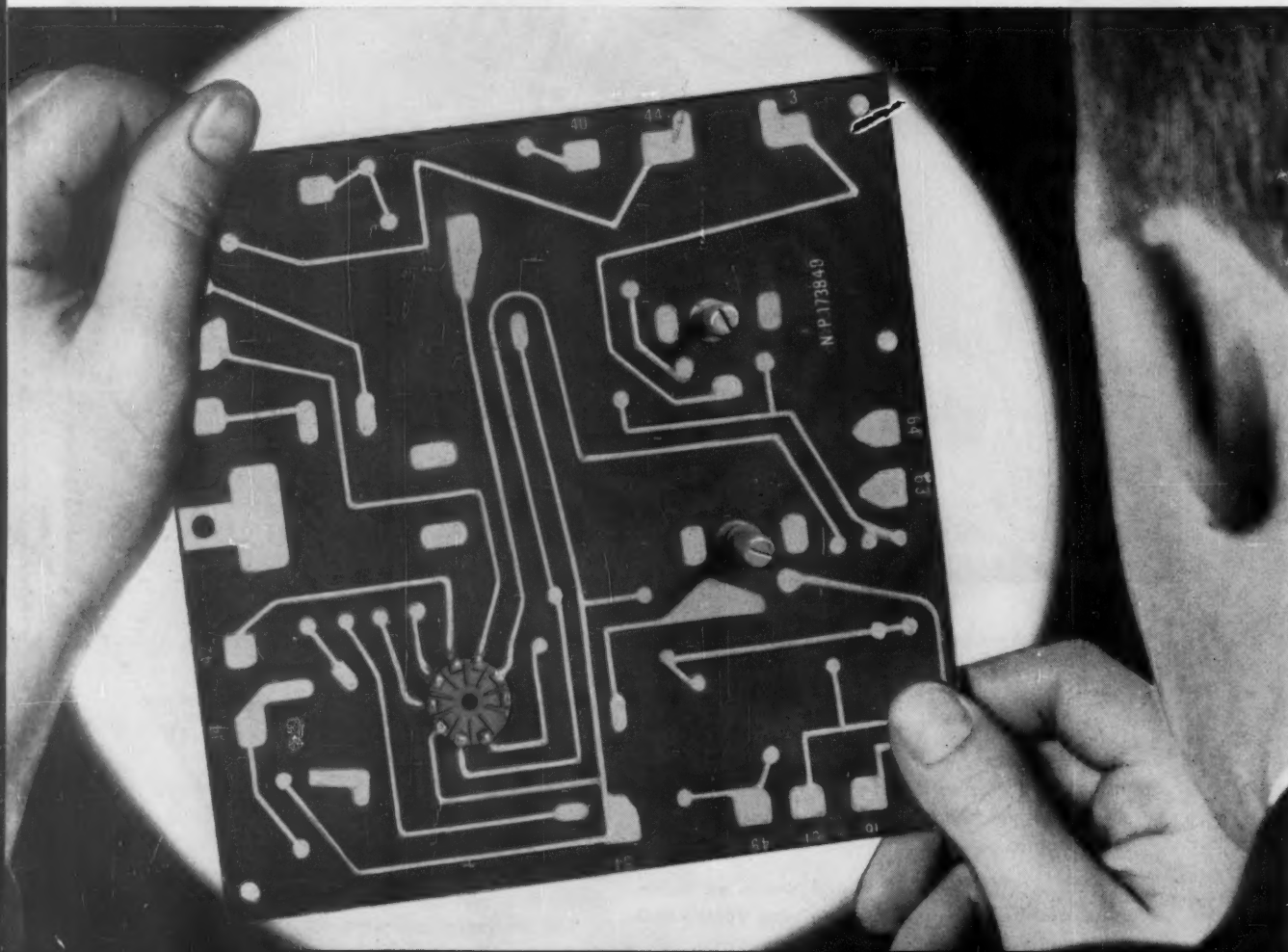
If you have a lubrication problem talk to a Cities Service Lubrication Engineer. Chances are he can solve it. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

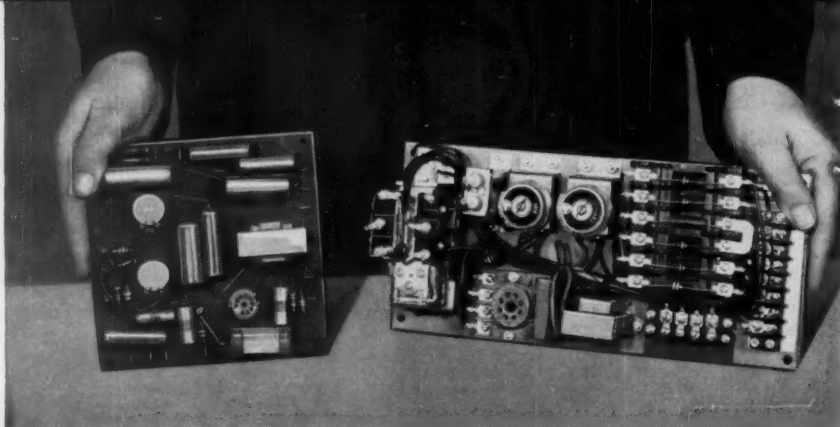
GENERAL ELECTRIC ANNOUNCES . . .

NEW, Low-price Thy-mo-trol*



Printed Circuits—or “wireless” circuitry—constitute the “brains” of the new general purpose Thy-mo-trol Drives. Simply, it is a method of printing an electrical diagram on the back of a sturdy, lightweight plastic board. The electrical “track” or diagram is made of solder-covered copper strips.

All circuit components within the “brain” are connected without the use of wiring! A protective coating is sprayed over the entire printed circuit. All connections to the control circuits are of the simple “plug-in” type, making attachment and removal of connecting circuits a simple, hand operation.



“Brain” of new Thy-mo-trol Drive—printed control circuits. Top photo shows printed electrical diagram. G.E.’s industrial adaptation of this process helps reduce size and complexity of circuits. In lower photo, new at left, conventional at right.

Drive with Printed Control Circuits

NOW! GET RELIABLE, SMOOTH, ADJUSTABLE SPEED FOR MACHINE TOOLS IN A SIMPLIFIED, LOW-PRICED DESIGN

Designed for quality performance, reliable operation, easy maintenance, and at a new low price, a new and simplified line of general purpose Thy-mo-trol Drives has been developed by General Electric. These drives represent a new and far-reaching step in electronic adjustable speed.

An approximate 20% price reduction under the line it replaces is possible because G-E has successfully simplified the entire control system and has adapted printed control circuits into the Thy-mo-trol panels. New Thy-mo-trol design allows a substantial reduction in

weight, size, circuit complexity, wiring, maintenance costs and installation cost. The new design is now available in two ratings: $\frac{3}{4}$ to 1 hp and $1\frac{1}{2}$ to 3 hp—making your choice of an adjustable speed drive to meet specific needs that much easier.

Operating directly from a-c power, the new standard Thy-mo-trol Drive includes an electronic control panel, a d-c motor, and a push-button station. No anode transformer is necessary if operated on 440 volts, 50 or 60 cycle, single phase power. Separately mounted auto-transformers are supplied as a

standard feature for voltages other than 440.

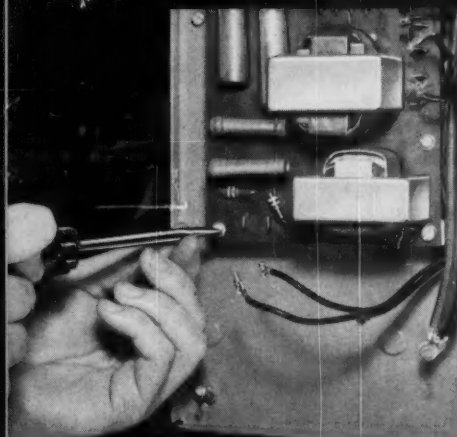
The new drive is rated at constant torque over the entire speed range. Speed range is 8 to 1 for continuous duty with higher ranges possible for special applications. Optional modifications include jogging, reversing, tachometer feedback, reactor loop control, and external current limit adjustment.

For more information on this outstanding new adjustable speed drive, contact your nearest G-E Apparatus Sales Office or write for Bulletin GEA-6234, General Electric Company, Section 791-1, Schenectady 5, New York.

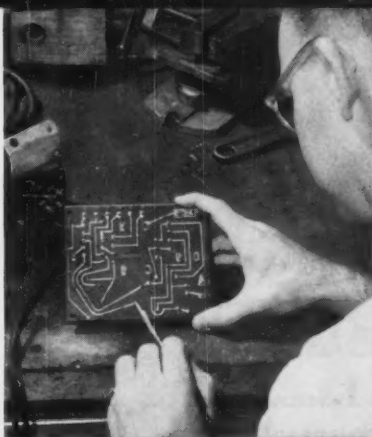
Progress Is Our Most Important Product

GENERAL  ELECTRIC

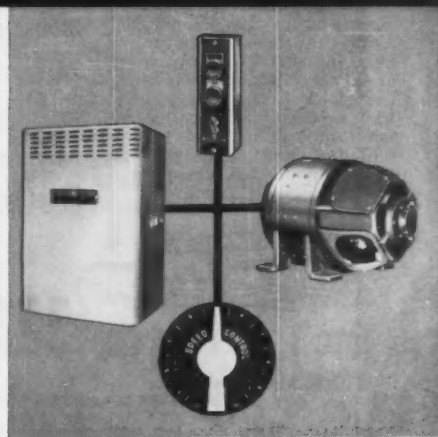
*Registered Trade-mark of General Electric Company



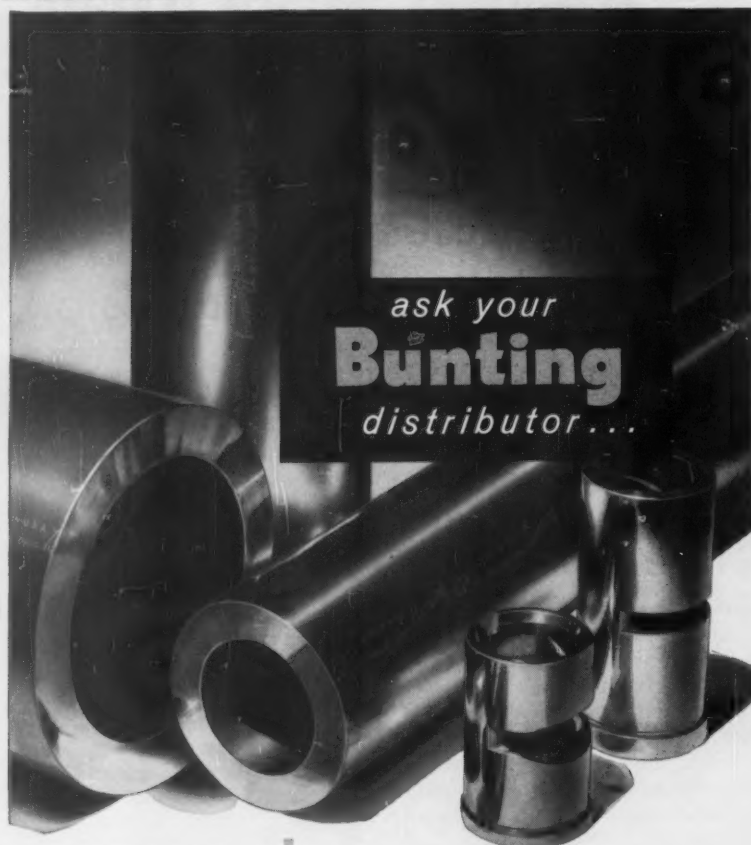
Easily attached or removed. Only a screwdriver is needed. Plugs and terminals are numbered for easier service.



Simplified repair. Component replacement is fast and easy—a simple bench operation. No need to discard entire unit.



Three basic units. DC motor, pushbutton station, and panel containing tubes and "brain" make up new Thy-mo-trol Drive.



JUST DIAL HIS NUMBER

Your Bunting Distributor carries in stock for your money saving convenience completely machined and finished Bunting Standard Stock Industrial Bearings, Electric Motor Bearings and Precision Bronze Bars in a complete range of sizes, meeting all your usual production and maintenance needs. You will find him listed in the classified section of your telephone book—most likely under the heading Bars, Bronze or Bearings, Bronze. Your Bunting Distributor is an industrial distributor or a specialist in certain industrial items. He has been especially selected for his responsibility and his understanding of bearing requirements. Ask him for the Bunting Catalog or write.



Bunting®

BRONZE BEARINGS • BUSHINGS • PRECISION BRONZE BARS

THE BUNTING BRASS AND BRONZE COMPANY, TOLEDO 1, OHIO
BRANCHES IN PRINCIPAL CITIES

... for this speedy cost-saving bearing service

The local availability of Bunting completely machined and finished bronze bearings and bars is saving money, time and trouble in machinery maintenance everywhere in America. Stocks of Bunting Bronze Bearings and Bars constantly carried by Bunting Distributors are adequate to supply the needs of the whole nation for an indefinite time.

BABBITT

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Ryerson, Jas. T., & Son, 2558 W. 16th St., Chicago 18, Ill.

BALANCING EQUIPMENT

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Cosa Corp., 405 Lexington Ave., New York 17.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Olsen, Tinius, Testing Mch. Co., Willow Grove, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pope Machinery Corp., Haverhill, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mich. Tool Co., 2531 11th St., Rockford, Ill.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

BALL BEARING TESTERS

Micrometrical Mfg. Co., 321 S. Main St., Ann Arbor, Mich.

BALLS

Kennametal, Inc., Latrobe, Pa.

BARs, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

BARs, Steel

Allegheney Ludlum Steel Corp., Bethlehem, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheeler, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded

Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

BEARINGS, Babbitt

Bunting Brass & Bronze Co., Spencer and Carlton Ave., Toledo, Ohio.

BEARINGS, Ball

Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Fafnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
New Departure Div., General Motors, Bristol, Conn.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.

BEARINGS, Bronze and Special Alloy

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Ave., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
(Continued on page 268)

for
the really
tough abrasive
jobs*

*brick mold liners,
for example

Chromewear

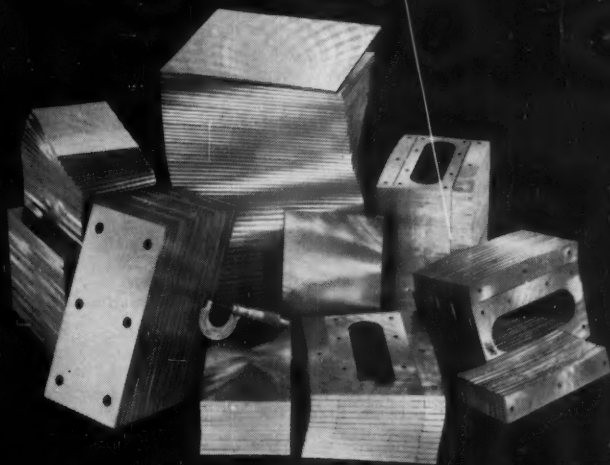
U. S. Patent 2,174,286

HIGHEST ABRASION-RESISTING STEEL

Independent laboratory tests have shown that CHROMEWEAR has abrasion resistance more than 30 times that of 1% carbon tool steel and 6 times that of high carbon-high chromium tool steels. No other known steel exceeds CHROMEWEAR in this respect. Wherever maximum wear resistance is required, with machining kept to a minimum, CHROMEWEAR is your outstanding choice. Typical uses are brick mold liners, liners for sand blast machines and sand slingers, drawing dies, ceramic molds, extrusion dies for ceramics. There is a Vanadium-Alloys Steel Company office near you for consultation and the prompt handling of your inquiries.

made by the originators
of High-Vanadium Steels

VANADIUM-ALLOYS STEEL COMPANY was first to produce 18-4-1 and 18-4-2 high speed steel, first to produce M-2, M-4 (Neatro) and T-15 (Vasco Supreme) high-Vanadium high speed steels—all nationally known for first quality performance over a wide range of applications.



No other steel has outperformed
CHROMEWEAR for brick mold liners

VANADIUM-ALLOYS STEEL COMPANY

Manufacturers of First Quality Tool and Die Steels

Latrobe, Pennsylvania

COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL CO.

In Canada:

Vanadium-Alloys Steel Canada Limited, London, Ontario

*Send for this new
fully-illustrated Bulletin*

A
REVOLUTIONARY
Tool Rotating
AUTOMATIC CHUCKING MACHINE

The

**GOSS &
DE LEEUW**

ONE-TWO-THREE



**FREE
ON
REQUEST**

Here are the answers to most of your questions as to what "ONE-TWO-THREE" means in describing this outstanding development of Automatic Chucking Machines by Goss and De Leeuw. You'll be interested not only in the revolutionary design of the machine itself, but also in its extraordinary performance—and how it is possible to handle from one to three operations—in sequence or simultaneously without changing set up.

Get this interesting, informative Bulletin NOW—
by merely asking for it.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.



BEARINGS, Lineshaft

Fafnir Bearing Co., New Britain, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle

Orange Roller Bearing Co., Inc., Orange, N. J.

BEARINGS, Roller

Ball & Roller Bearing Co., Danbury, Conn.
Fafnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
Norma-Hoffman Bearings Corp., Stamford,
Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St.,
Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, Self Lubricating (Oilness)

Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carl-
ton Ave., Toledo, Ohio.

BEARINGS, Tapered Roller

Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, Thrust

Ball & Roller Bearing Co., Danbury, Conn.
Bunting Brass & Bronze Co., Spencer and Carl-
ton Ave., Toledo, Ohio
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Marlin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia,
Pa.
Norma-Hoffman Bearings Corp., Stamford,
Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearing Co., Inc., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.

BELT SHIFTERS

Standard Pressed Steel Co., Jenkintown, Pa.

BELTING, Transmission

Chicago Rawhide Mfg. Co., 1301 Elston Ave.,
Chicago 22, Ill.
Houghton, E. F. & Co., 303 W. Lehigh Ave.,
Philadelphia, Pa.

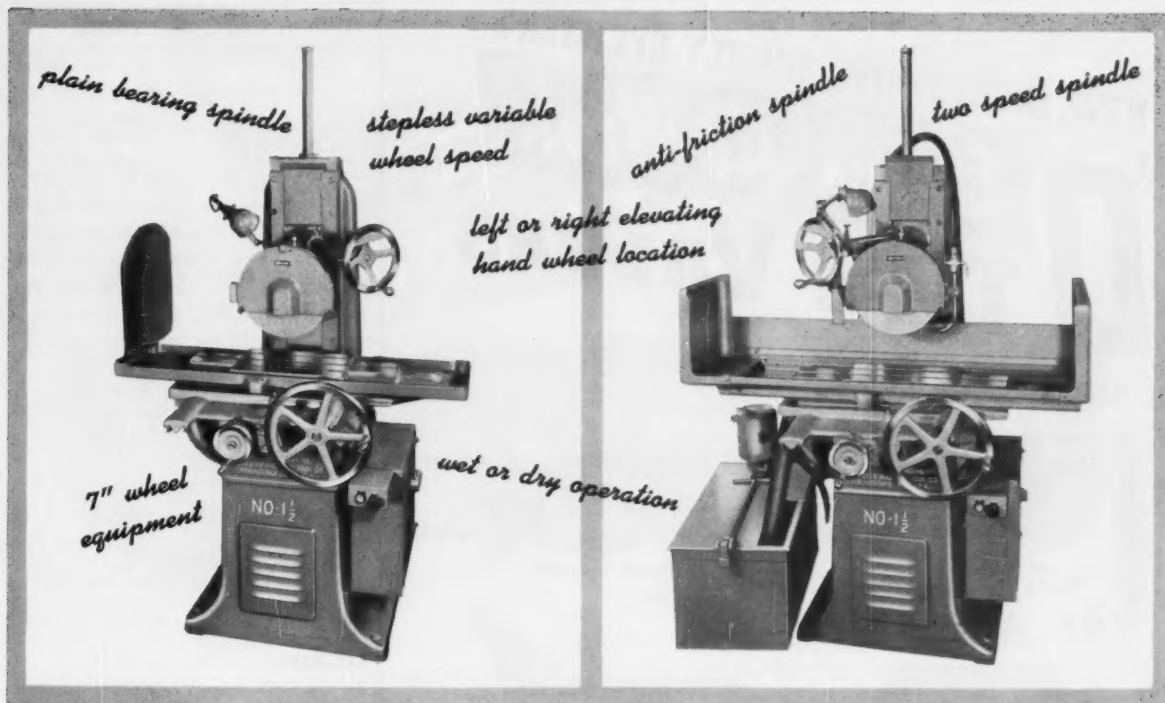
BENCHES, Work, and Bench Legs

Standard Pressed Steel Co., Jenkintown, Pa.

BENDING MACHINES, Angle Iron, Plate, Etc.

Consolidated Mch. Tool Corp., 656 Blossom
Rd., Rochester, N. Y.
Hamifin Corp., 501 S. Wolf Rd., Des Plaines,
Ill.
Verson Allsteel Press Co., 93rd St. & S. Ken-
wood Ave., Chicago, Ill.
Wallace Supplies Mfg. Co., 1304-08 Diversey
Pkwy., Chicago, Ill.

(Continued on page 270)



You know the standard Abrasive
No. 1½ . . . but do you know about
its optional features?

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ACCURACY BOASTS PRODUCTION

ABRASIVE MACHINE TOOL CO.
12 Dunellen Road East Providence 14, R. I.

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the Abrasive No. 1½ Hand Feed Surface Grinder.

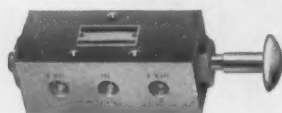
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Company.....

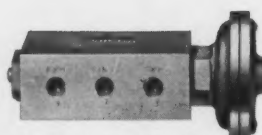
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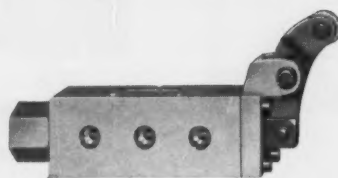


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FOR A WIDE



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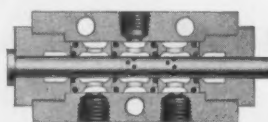


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• These newly developed valves combine greatly simplified construction, positive positioning of all parts and quick, easy repacking in the field. There is no direct impingement of flow across the packings, greatly prolonging their life. All metal parts are aluminum except the hollow, radially ported, stainless steel plunger. $\frac{1}{8}$ " and $\frac{1}{4}$ " pipe connections. 2, 3, 4 and 5-way actions. Write for Bulletin No. 531 today! *It gives full details.*

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SINGLE PLUNGER SOLENOID VALVES
In single or double solenoid designs. Low amperage requirement eliminates intermediate relays and simplifies electrical control circuits.



WATER SYSTEM VALVES pilot cylinder operated, sizes to 8". Can be installed with automatic remote control as a plant protection measure to shut off water to certain parts of the plant in case of emergency so the entire available supply is directed where it is most needed.

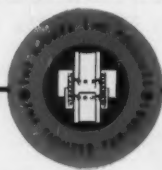
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AIR AND HYDRAULIC

Control Valves

Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

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Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 30 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy., Chicago, Ill.

BENDING MACHINES, Pipe

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy., Chicago, Ill.

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Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
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Ingersoll-Rand Co., Phillipsburg, N. J.
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Westinghouse Electric Corp., E. Pittsburgh, Pa.

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Dykem Co., 2303P. N. 11th St., St. Louis 6, Mo.

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Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

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Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLTS AND NUTS

Bethlehem Steel Co., Bethlehem, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Russell, Burdall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

BOOKS, Technical

Industrial Press, 148 Lafayette St., New York 13, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

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Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.

(Continued on page 274)

Specialists in AUTOMATIC MACHINES

SWANSON

TOOL & MACHINE PRODUCTS INC., ERIE, PA.

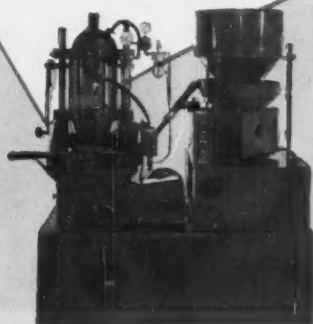
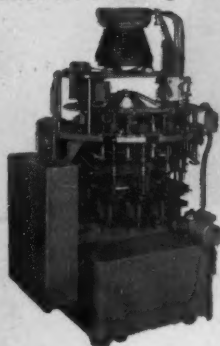
Since 1919

Swanson offers a fully integrated organization experienced in engineering and building special automatic machines for machining, processing and assembling small and medium parts. Illustrated are typical examples of Swanson special machines which are improving quality and lowering costs in a wide range of manufacturing operations. Because they incorporate Swanson-developed standard components wherever applicable, both time and money were saved in their completion.

If you have a problem in automation, tell us about it. We'd like to help.

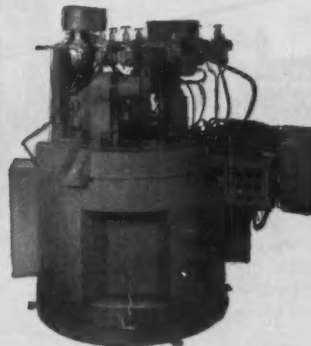
Your inquiries will be treated in full confidence...our recommendations submitted without obligation.

Completely automatic turret type machine for processing four electronic parts simultaneously at each index. Equipped with hopper feed, automatic chucking, transfer mechanism, Swanson-designed memory device and automatic unloading.



An automatic straight-line indexing machine, designed for injecting cement into flash bulb bases. Machines of this type have increased previous production rates by three to five times.

This special machine for drilling, tapping, reaming and counterboring cigarette lighter parts at 1200 per hour, was designed and built around a standard 8-station Swanson Turret Indexing Unit.

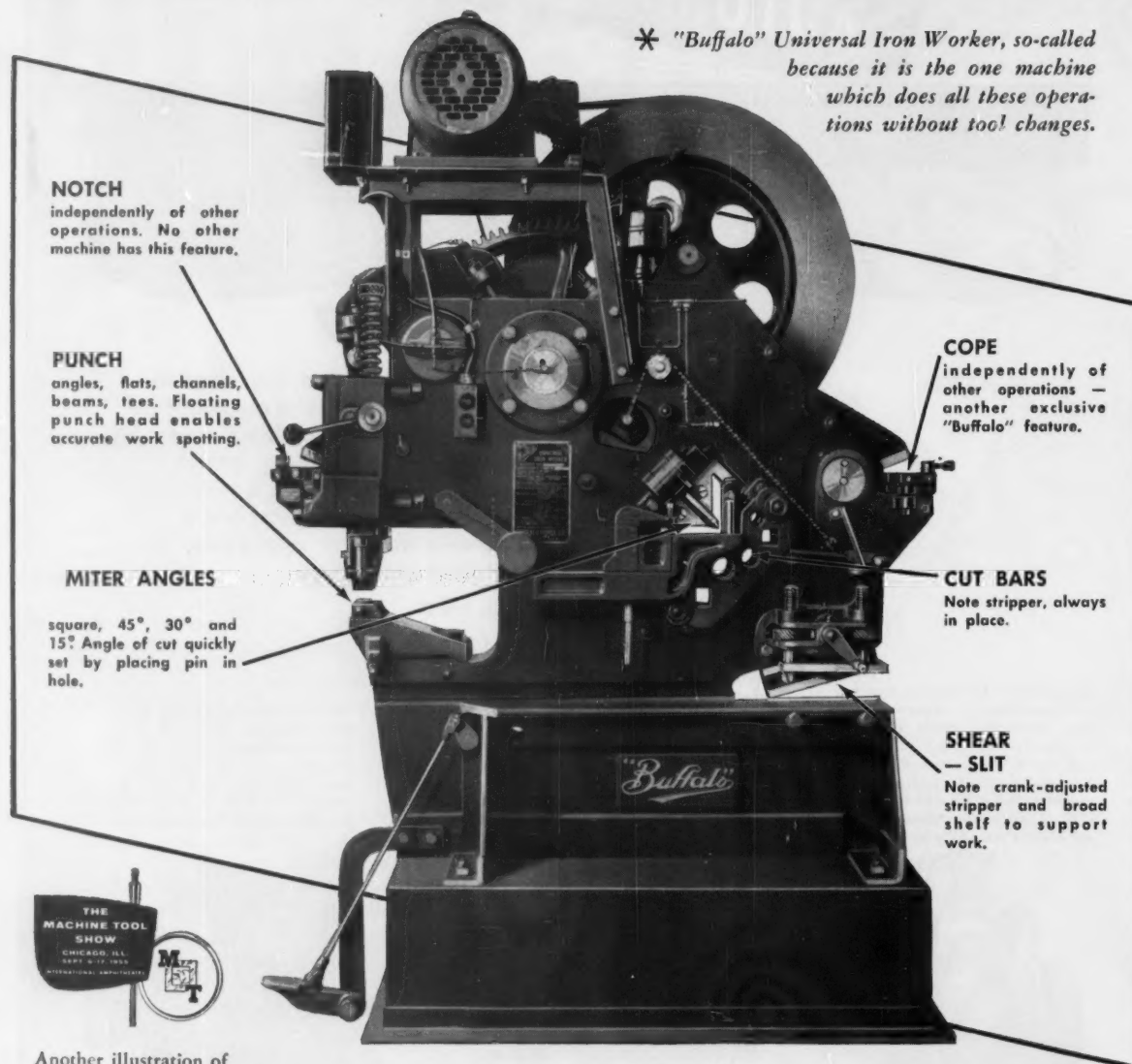


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YOU CAN DO MORE JOBS IN LESS TIME — WITH A U.I.W.*

* "Buffalo" Universal Iron Worker, so-called because it is the one machine which does all these operations without too! changes.



NOTCH

independently of other operations. No other machine has this feature.

PUNCH

angles, flats, channels, beams, tees. Floating punch head enables accurate work spotting.

MITER ANGLES

square, 45°, 30° and 15°. Angle of cut quickly set by placing pin in hole.

COPE

independently of other operations — another exclusive "Buffalo" feature.

CUT BARS

Note stripper, always in place.

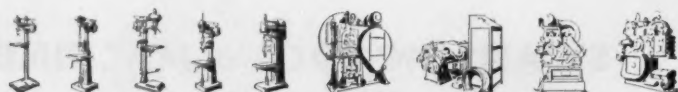
SHEAR — SLIT

Note crank-adjusted stripper and broad shelf to support work.



Another illustration of the "Q" Factor in "Buffalo" machines—the built-in Quality which provides trouble-free satisfaction and long life.

A Universal Iron Worker will save space — time — excessive conveying of work from machine to machine in your shop — because it does so many jobs. Often called the "most useful machine in the shop". For complete details, write for Bulletin 360.



BUFFALO FORGE COMPANY

440 BROADWAY

BUFFALO, NEW YORK

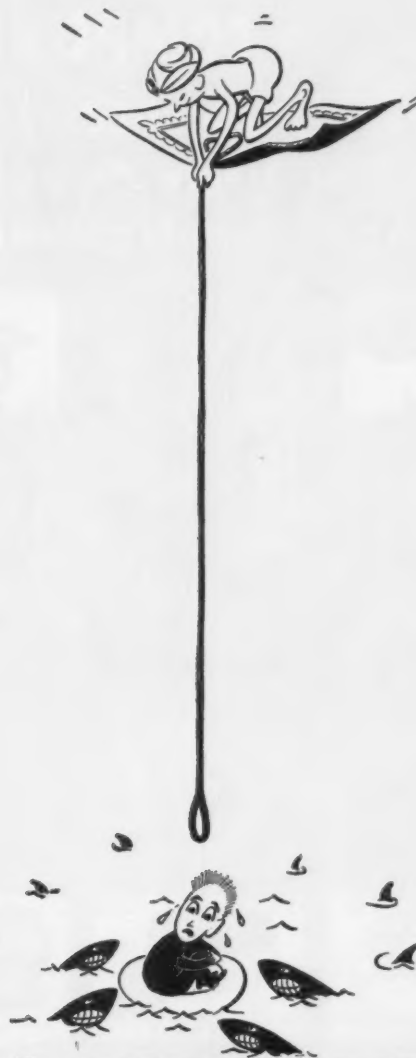
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

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PUNCHING

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...for delivery when you need it

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CUTTING TOOLS AND GAGES**



Made by **THREADWELL**, Greenfield, Mass.

HARTFORD*Special***STANDARD
COMPONENTS**

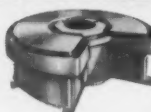
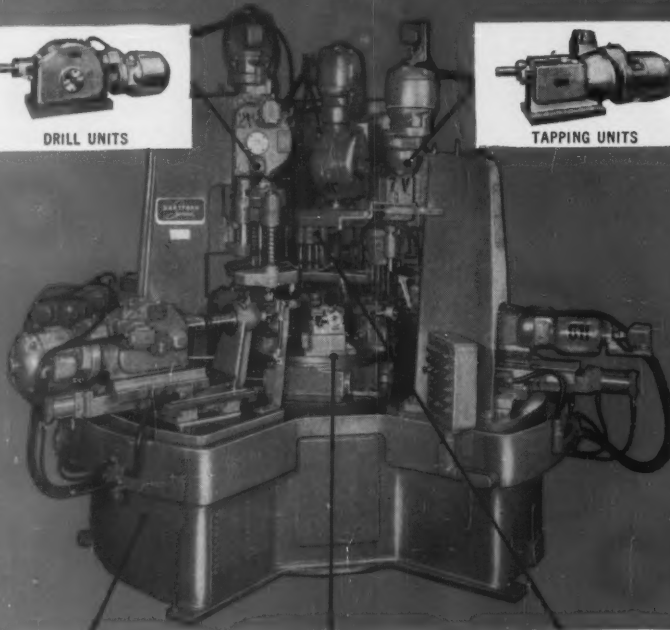
take the "SPECIAL"
out of Single Purpose
Drilling & Tapping Machines



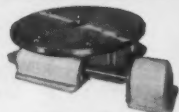
DRILL UNITS



TAPPING UNITS



BASES



INDEX TABLES



DRILL HEADS

Standardization of elements of special machines is the "top priority" project at Hartford Special. These well engineered machine components are available in machines that we design and build, or as separate components to help lower the cost of machines of your own construction. Our large, well trained staff of Sales Engineers is ready to study your machining requirements and provide, without charge, a cost saving machine proposal.

BOOTH 201

**HARTFORD***Special*

MACHINE TOOL DIVISION
THE HARTFORD SPECIAL MACHINERY CO.
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- ☐ Have a Field Engineer call to review our processing
☐ Send brochure of Drilling & Tapping Machines

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City _____

Zone _____

State _____

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Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio
National Acme Co., 170 E. 131st St., Cleveland, Ohio
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Wales-Strippet Corp., North Tonawanda, N. Y.

BORING AND TURNING MILLS, Vertical

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Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

BORING BARS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Precision Tool & Mfg. Co., 1305 S. Laramie, Cicero 50, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

**BORING, DRILLING AND MILLING
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(Floor, Planer or Table Types)

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Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A. Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Innocenti Corp., 43 W. 61st St., New York 23, N. Y.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Portage Machine Co., 1069 Sweitzer Ave., Akron 11, Ohio
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.

(Continued on page 276)

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AT YOUR FINGERTIPS**



Drop Forged Stainless Steel—with made hard
nose; shielded operating button; comfortable
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doubles as hang-up hook—parts easily replaced.



Button Type—forged
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brass body; air con-
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maintained.



Use Schrader blow guns... 36 designs and styles

Schrader Blow Guns are made to *fit your hand... fit your job!* Schrader Blow Guns are built to take it—here's why:

They're rugged both in design and construction. Bodies are drop-forged either of brass or stainless steel.

They're convenient—can be used anywhere. Blow gun circuits—using Schrader Couplers, Hose and Automatic Hose Reels—take little space, yet put compressed air right at your fingertips.

They're economical—they have few moving parts.

And replacement parts, when and if needed, are easily installed.

They're versatile—with nine interchangeable noses—both fixed and adjustable—that fit all three standard-type guns, you can't think of a blow-gun application that Schrader can't meet.

It's easy to find out for yourself what a wide selection of blow guns is in the complete Schrader Line of air control equipment. Write today—or, if you prefer, fill out the coupon below.

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SPECIAL ADJUSTABLE NOSES



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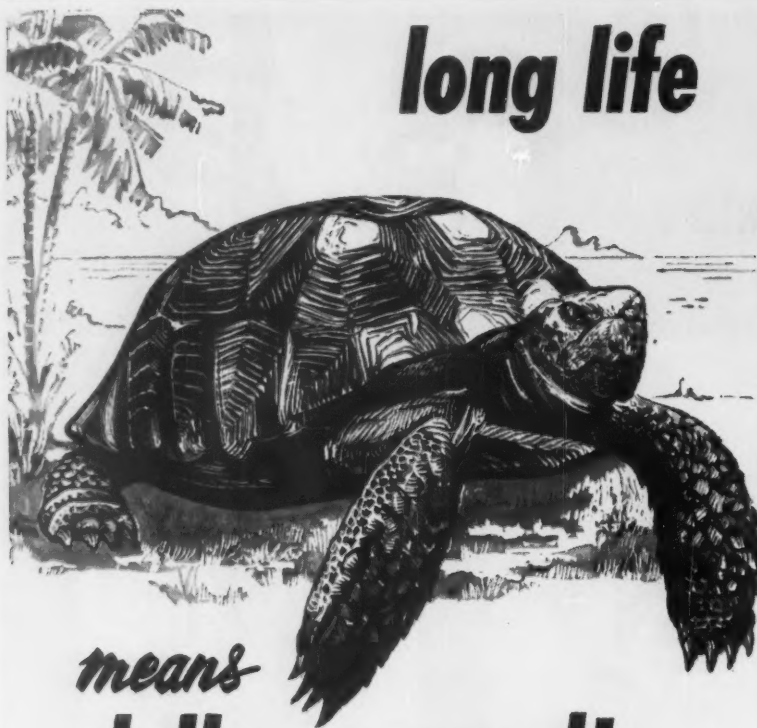
Name _____ Title _____

Company _____

Address _____

For more information on products advertised, use inquiry Card, page 243

MACHINERY, August, 1955—275



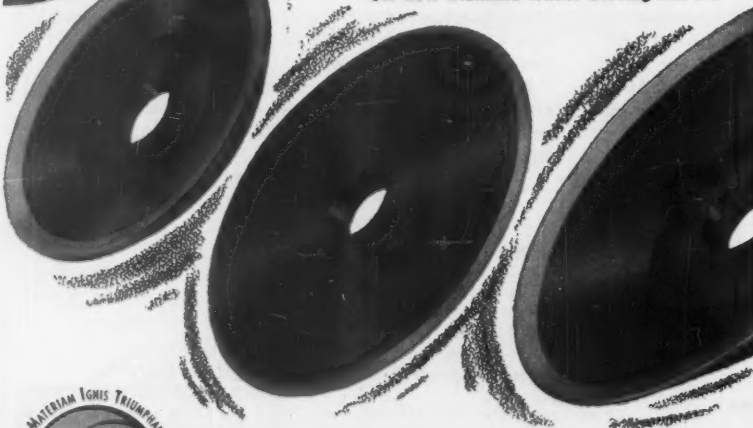
means
dollars saved!

Whether a 200 year old tortoise would admit this statement is debatable, but with Diamond Wheels it is an indisputable fact.

Even then, long wear depends upon many factors; Speed, correct use of coolant and of prime importance, the wheel must be just right for your job... in diamond grit size, bond, and in every other detail.

We at J. K. Smit, know after many years experience how to satisfy every grinding and cutting need.

Send for your copy of
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Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Mummert-Dixon Co., Hanover, Pa.
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Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

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Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
National Automatic Tool Co., Inc., 5 7th and N. Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

BORING MACHINES, Jig

American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Orban Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Wales-Strippet Corp., North Tonawanda, N. Y.

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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
The Atrax Co. (Carbide) 240 Day St., Newington 11, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth-Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit, Mich.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
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Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Precision Tool & Mfg. Co., 1305 S. Laramie, Cicero 50, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago, 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BRAKES, Press and Bending

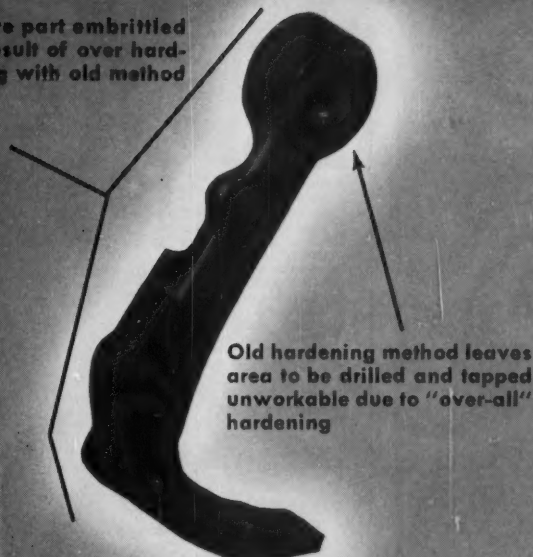
Bliss, E. W., Co., 1375 Raff Road, S. W. Canton, Ohio.
Cincinnati Shaper Co. Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

(Continued on page 278)



MODERN HEAT PROCESSING

Entire part embrittled as result of over hardening with old method



Old hardening method leaves area to be drilled and tapped unworkable due to "over-all" hardening

G-E induction heating leaves area to be drilled and tapped still soft and workable



Only area of greatest wear has been selectively hardened with G-E induction heating

PROBLEM:

Chill-cast rejects at Draper Corporation due to (1) Embrittlement (2) Over-all hardening

SOLUTION:

G-E Induction Heater Cuts Rejects 95% By Pinpoint Hardening Cast-iron Parts

The East Spartanburg, S. C. division of Draper Corporation was having difficulty controlling the hardening of cast-iron parts. Their old chill-cast hardening method forced them to reject many of the parts, which were overhardened and brittle. In addition, they had no way of controlling the size of the area to be hardened. This made drilling and tapping operations difficult—and frequently impossible.

SINCE INSTALLING A 20-KW G-E induction heater in their production line, they are able to cast the parts, drill and tap them while the cast iron is still soft, and then selectively harden only the area of greatest wear. This "pinpoint" hardening reduces the heated area of the parts by

70-90%. As a result, rejects have been cut 95%, costs are reduced, and the Draper Corporation is producing a product of uniform high quality.

THE COMPLETE SATISFACTION of Draper Corporation with their General Electric induction heating equipment was expressed by Mr. Fred Burgess, Plant Engineer: "Our G-E induction heater has been in operation for over five years. During that time we have greatly reduced manufacturing costs because of our decreased scrap losses and increased production. Maintenance of the heater hasn't been any problem, either. We just couldn't ask for any better service than we've had from our G-E equipment."

WATCH FOR ANNOUNCEMENT

of General Electric's complete
NEW line of electronic
Induction heaters

For application assistance, contact your nearest G-E Apparatus Sales Office or send coupon for free bulletin GEA-4945.

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Apparatus Sales Division, Section C722-2
Schenectady 5, New York

Name.....

Position.....

Company.....

City..... State.....

GENERAL  ELECTRIC



Courtesy of Brown & Sharpe

THE FIRST GRINDING LUBRICANT



W & B Grinding Lubricant E-1, the first lubricant made especially for wet grinding, for half a century has been the choice of leading manufacturers all over the world.

W & B E-1 offers these advantages:

- HIGHEST REFLECTIVE FINISH
- EXTREMELY LOW MICRO-INCH READING
- ROUGH AND FINISH GRIND WITH THE SAME WHEEL
- AGREEABLE TO OPERATORS

W & B E-1 is just one of a complete line of metalworking lubricants made by White & Bagley Co., specialists in the field for 67 years!

Let a W & B lubrication expert help solve your metalworking problems. Just mail the coupon *today*.

THE WHITE & BAGLEY CO.

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 Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio
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BROACHES

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 duMont Corp., Greenfield, Mass.
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 Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
 National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
 Shearcut Tool Co., Reseda, Cal.
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
 Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

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 Cincinnati Milling Mch. Co., Cincinnati, Ohio.
 Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
 Consolidated Mch. Tool Corp., Rochester, N. Y.
 Detroit Broach Co., P. O. Box 156, Rochester, Mich.
 Foote-Burt Co., 130 St. Clair Ave., Cleveland 8, Ohio.
 Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
 Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.
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 Pittsburgh Plate Glass Co., Brush Div., Baltimore 29, Md.

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 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

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 Chambersburg Engrg. Co., Chambersburg, Pa.
 Erie Foundry Co., Erie, Pa.
 Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
 Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

BURS

See Files and Burs, Rotary

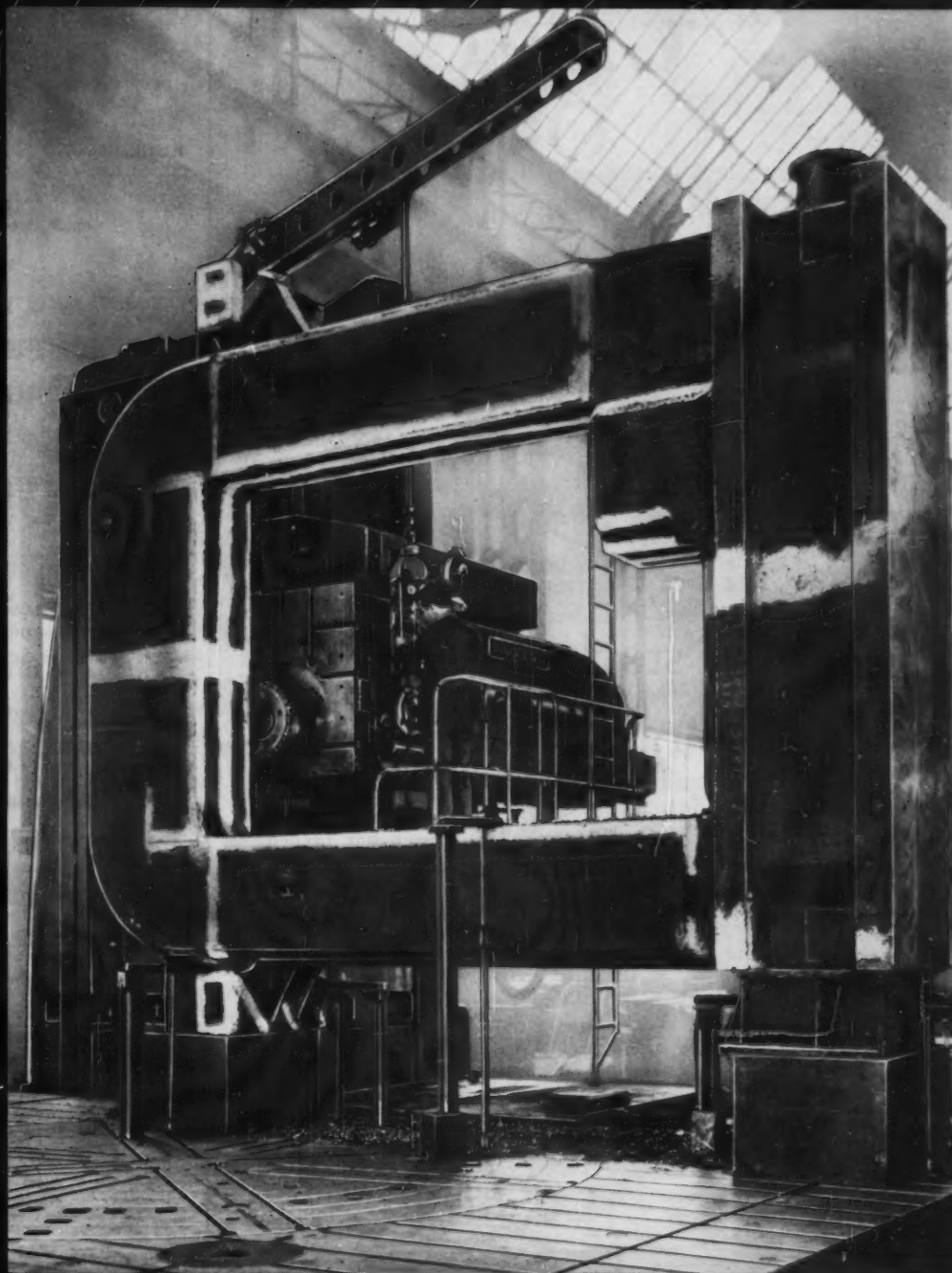
BUSHINGS, Brass, Bronze, Carbide, Etc.

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
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(Continued on page 280)

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Leland-Gifford Co., 1925 Southbridge St.,
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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
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Universal Engrg. Co., Frankenmuth, Mich.

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Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St.,
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Starret, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

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Rowbottom Machine Co., Waterbury, Conn.

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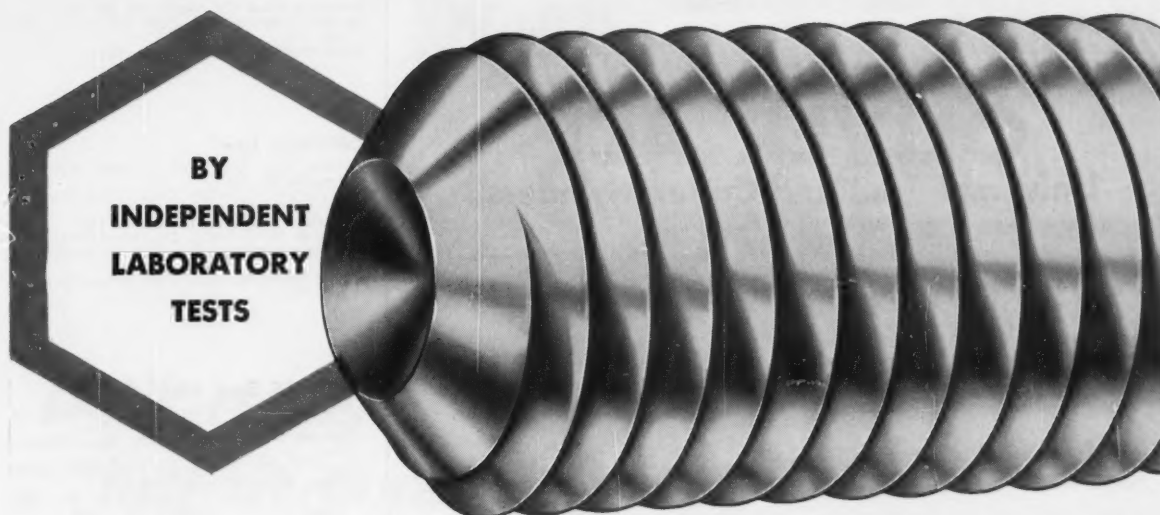
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pitts-
burgh 30, Pa.
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Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich.
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See Furnaces, Heat-Treating
(Continued on page 282)

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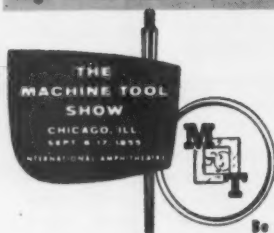
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Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York
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(Continued on page 284)

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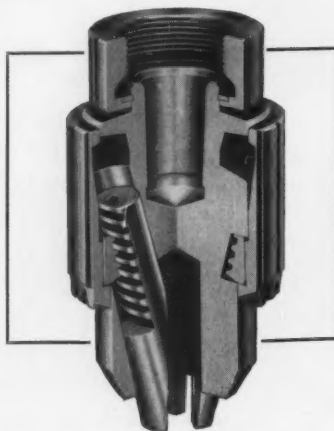


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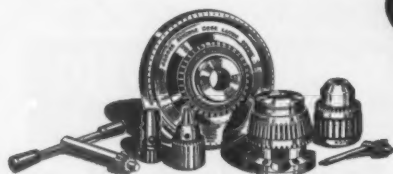
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Goss & DeLeeuw Mch. Co. (Multiple Spindle),
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See Collets

CHUCKS, Diaphragm

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(Continued on page 286)

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 Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
 Skinner Chuck Co., 344 Church St., New Britain, Conn.
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
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 Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
 Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

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 Taft-Peirce Mfg. Co., Woonsocket, R. I.
 Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

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CHUCKS, Quick Change and Safety

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 Proconier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
 Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
 Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel

Gardner Mch. Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping

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 Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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 Universal Engrg. Co., Frankenmuth 2, Mich.
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See Gages, Comparator.

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(Continued on page 288)



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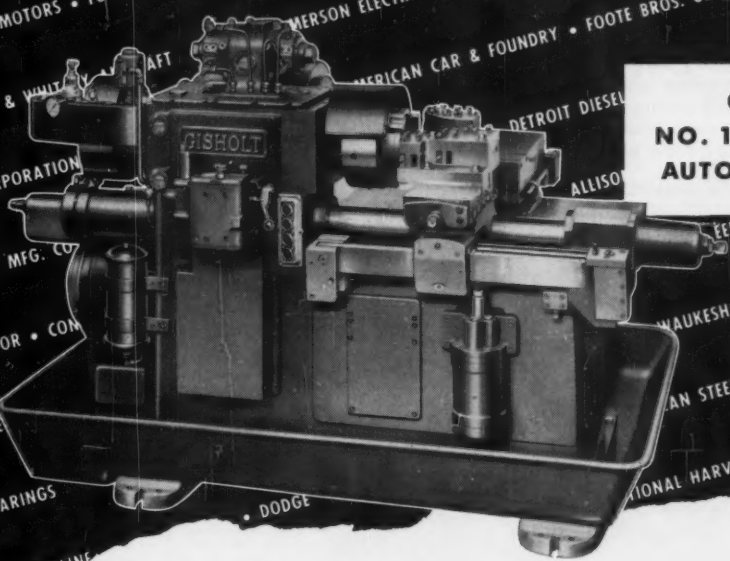
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 ADDRESS _____
 CITY _____ ZONE _____ STATE _____

M-8

• TIMKEN • FRIGIDAIRE
 • GENERAL MOTORS • S.K.F. INDUSTRIES • BRIGGS & STRATTON
 • STANDARD STEEL SPRING • PACKARD • CATERPILLAR TRACTOR • HAMILTON STANDARD PROPELLERS
 • MINERAL MOTORS • FOUR WHEEL DRIVE AUTO • KEARNEY & TRECKER • J. I. CASE • FEDERAL MOGUL • OLDSMOBILE • LADISH DROP FORK
 • PRATT & WHITNEY • MERSON ELECTRIC • AUTO SPECIALTIES MFG. • REED ROLLER BIT • CUMMINS ENGINE • WALTER KIDD
 • FALK CORPORATION • AMERICAN CAR & FOUNDRY • FOOTE BROS. GEAR • JOHNSON BRONZE • TYSON ROLLER BEAR
 • SINGER MFG. CO. • DETROIT DIESEL • ALLISON • DETROIT TRANSMISSION
 • FORD MOTOR • CONRAD • WAUKESHA MOTOR • JOHNSON MOTORS • MOTOR WHEEL
 • STUDEBAKER • AMERICAN STEEL FOUNDRIES • AMPCO METAL • CUSHMAN CO.
 • HYATT BEARINGS • NATIONAL HARVESTER • LANSLOWNE STEEL • WRIGHT AERONAUTICS
 • MINNEAPOLIS-MOLINE • DODGE • ATLANTIC DIESEL • TEXAS INSTRUMENTS • CHRYSLER



**GISHOLT
NO. 12 HYDRAULIC
AUTOMATIC LATHE**

What makes this machine so popular?

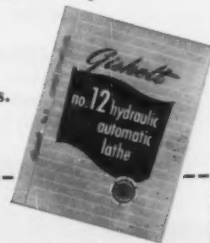
It's the simple basic application of hydraulic principles—perfected through the years. It's a single spindle machine that handles all classes of work—holding with a chuck or an arbor, with fixtures, or with a work driver for between centers. Front carriage alone will perform 14 different cycles. Independent rear slide can be positioned at any angle to the work. Feeds are infinitely adjustable...not limited by cams. Here's the versatility, the

speed, the automatic cycle, and the easy change-over that mean big savings for scores of users. Why not for you?

If you have parts up to 12" to produce at lower cost, look at the Gisholt No. 12 Hydraulic Automatic Lathe. Call your Gisholt representative. Or write us.

This new catalog will show you why.

All operating features are clearly described, fully illustrated. Here, too, are 28 different jobs to show many classes of work and tooling possibilities. Write for your copy.



THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT
MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES
SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Gisholt Machine Company
Madison 10, Wisconsin

Please send my copy of the catalog describing the Gisholt No. 12 Hydraulic Automatic Lathe.

Name.....Title.....

Company.....

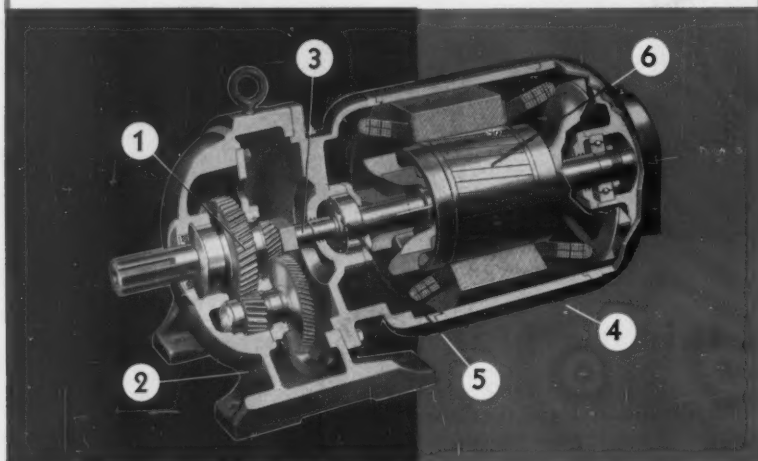
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City.....State.....

to MACHINE BUILDERS, Howell suggests

What to look for in Gearmotors

- 1. Lifetime gearing.** The wear-resistance of gears depends, in good measure, upon their hardness. Howell's Duti-Rated Lifetime gears have a Rockwell hardness (52-60) substantially higher than the industry average.
- 2. Compact, permanently aligned case.** Machine designers like the space-saving compactness of the Howell gear case. Pyramidal mounting puts support where it's needed — avoids the shaft misalignment possible when motor and gears have separate supports.
- 3. Rugged, solid-shank pinion.** Howell's pinion design, with threaded coupling and self-broaching splines, makes a failure-proof shaft connection between motor and gears. No troublesome keys.



- 4. NEMA-standard motors** give machine builders and users complete motor interchangeability, help them reduce inventories and simplify purchasing. Howell gearmotors give you this valuable feature — with the new re-rated motors included!
- 5. Fully-protected bearings** insure longer motor life. Dirt can't enter Howell's double-shielded bearings either from inside or outside the motor, because they are sealed in the end-plate cavities by dust-tight inner caps.
- 6. Copper-clad rotors** mean better heat conductivity, stability at high temperatures and, as opposed to die-cast rotors, greater design flexibility to meet your particular motor requirements. All Howell motors have them.



Gearmotors Cut Costs. Actual savings achieved by Howell gearmotors over separate motor-plus-reducer-plus-coupling drives are available for your study. Just request "Gearmotor Savings Table" when you write for catalog.

WRITE FOR BULLETIN GM-1

Howell gearmotor capacities: parallel shaft, 1 to 150 hp; right angle shaft, 1/2 to 40 hp.

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.
Precision-built motors for industry since 1915.



Oakite Products, Inc., 19 Rector St., New York, N. Y.
Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
White & Bagley Co., Worcester, Mass.

COMPOUNDS, Resin and Molding

General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Eisler Engrg. Co., 760 S. 13th, Newark 3, N. J.
Erie Foundry Co., Erie, Pa.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Follows Gear Shaper Co., Springfield, Vt.
Hartford Special Machry. Co., 287 Homestead Ave., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Lees-Bradner Co., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 250 Kishwaukee St., Rockford, Ill.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.

CONTROLLERS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee.
Clark Controller Co., Cleveland, Ohio.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

CONVEYORS FOR DUST, CHIPS, ETC.

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

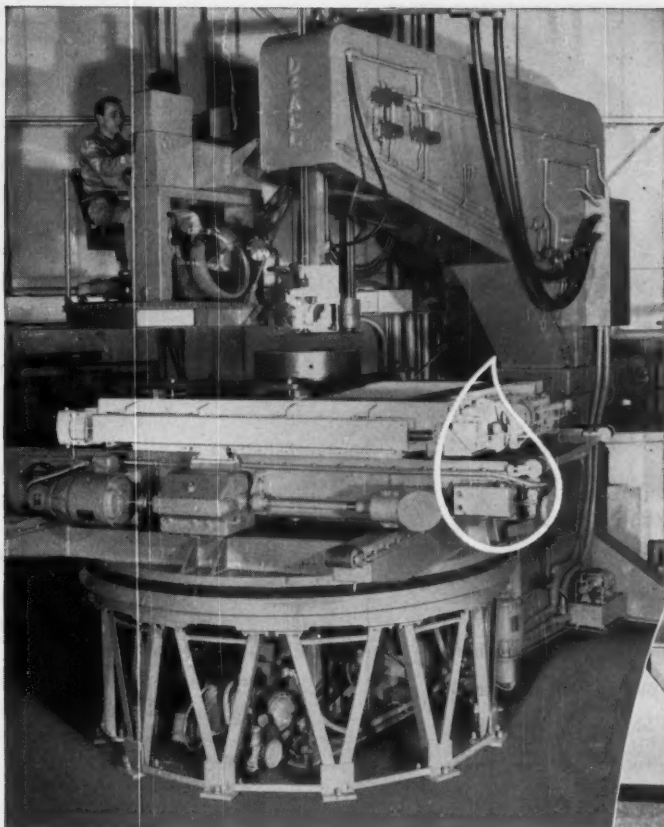
COOLANT SEPARATORS

See Separators, Oil or Coolant

COUNTERBORES

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.

(Continued on page 290)

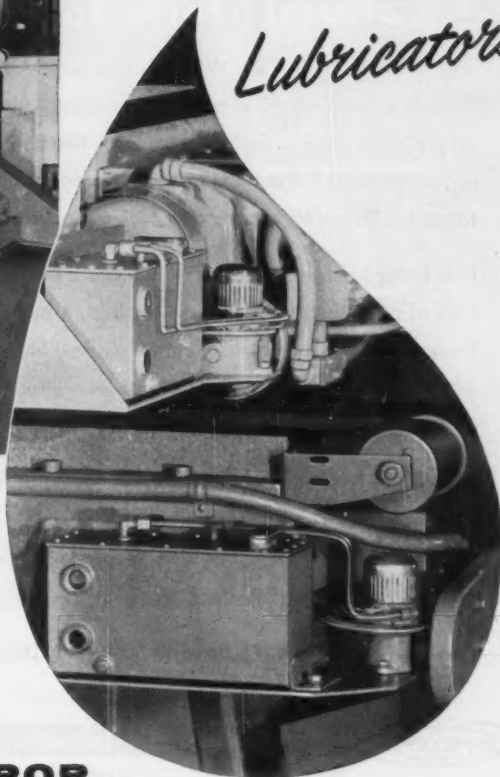


Two Madison-Kipp OL Lubricators installed on the world's largest band machine and die filer, manufactured by the DoALL Co., Des Plaines, Illinois... Operated by remote control, they machine 10-ton extrusion dies for the Air Force "Heavy Press Program."

**MACHINES OF GREAT
PERFORMANCE USE THE
MOST DEPENDABLE OILING
SYSTEM EVER DEVELOPED**

...MADISON-KIPP

Lubricators



Fresh Oil...

BY THE MEASURED DROP

...from a Madison-Kipp Lubricator is the most
dependable method of lubrication ever developed. It is applied as
original equipment on America's finest machine tools, work engines
and compressors. You will definitely increase your production
potential for years to come by specifying Madison-Kipp
on all new machines you buy where oil under pressure
fed drop by drop can be installed.

kipp

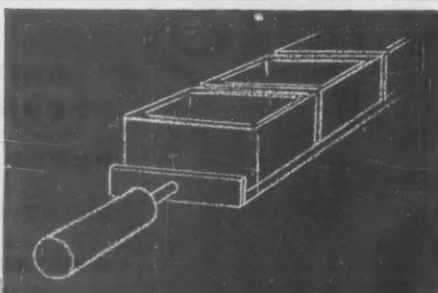
MADISON-KIPP CORPORATION
203 WAUBESA STREET • MADISON 10, WIS., U.S.A.

● Skilled in Die Casting Mechanics ● Experienced in Lubrication Engineering ● Originators of Really High Speed Air Tools

For more information on products advertised, use inquiry Card, page 245

MACHINERY, August, 1955—289

HOLCROFT and the PUSHER FURNACE



An Answer to Stock Handling Problems

When it's time to select a new heat treat furnace, a good move is to consult a specialist—one who understands all phases of the job. Such a specialist is Holccroft. A thorough study of your problem will result in basic recommendations designed to improve quality control—pare costs—give production a lift.

One factor involved in selecting a furnace is the decision as to which type of stock handling will do the job best. A pusher-type furnace—because of its low cost—is often the answer. Stock may be pushed through the heat treat cycles in one of four different ways: on trays, on pusher blocks, in cars, or with one part pushing the other.

Methods of handling stock are discussed in Holccroft's book "Blazing the Heat Treat Trail". It's a good idea to have a copy (just write) in your files. And it's a better idea to call Holccroft when you have a problem. Do it today!

HOLCROFT & CO., 6545 Epworth Boulevard, Detroit 10, Michigan.



PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

CHICAGO, ILL.
HOUSTON, TEXAS

CLEVELAND, OHIO
LOS ANGELES, CALIF.

DARIEN, CONN.
PHILADELPHIA, PA.

CANADA: Walker Metal Products, Ltd., Windsor, Ontario



290—MACHINERY, August, 1955

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Starrett, The L. S. Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Jarvis Corp., Middletown, Conn.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.

COUNTERS, Revolution

Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S. Co., Athol, Mass.

COUNTING DEVICES

Starrett, The L. S. Co., Athol, Mass.

COUPLINGS, Flexible

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Sier-Bath & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

(Continued on page 292)

Small Drum Switches—

for manual control

of pilot circuits



Where a number of circuits must be switched in a given sequence, the drum switch is often the simplest and lowest cost answer. For example, for conveniently monitoring a group of pyrometers, the Allen-Bradley Style C instrument drum switch is a simple circuit selector. Or, when small motors need to be reversed only occasionally, the Style B drum is a good, low cost choice.

The Allen-Bradley line covers such a

broad range of types and sizes of drum switches for small single and three phase motors that practically any industrial requirement can be satisfied.

Allen-Bradley drum switches use silver alloy contacts of a very simple construction. Contact pressure is generous... construction is rugged. Though low in cost, there is nothing cheap about any of these drum switches. For complete listings, write for the A-B 120-page Handy Catalog.

Allen-Bradley Co., 1331 S. First St., Milwaukee 4, Wis. • In Canada—Allen-Bradley Canada Ltd., Galt, Ont.



ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

QUALITY

C

Product Directory



400 AUTOMOTIVE PISTON RINGS per minute are ground within .0002" tolerances on this new Besly Model 240 Double Horizontal Spindle Grinder. Electro-magnetic rotary pick-off disc at left automatically delivers piston rings in continuous flow between abrasive discs.

BESLY Announces New High Precision, High Production Grinder

Grinds parallel surfaces within .0002" at rates
as high as 400 units per minute

The new model No. 240 Besly Double Horizontal Spindle Grinder was developed to meet today's increasing demands for greater accuracy and higher production. Grinding the parallel faces of piston rings is a natural job for the No. 240 Grinder. Automotive rings are being ground at the rate of 400 pieces per minute to .0002" for parallelism.

New in Design

The Model 240 is an entirely new development in the Besly line of precision grinders. New features include automatic controls which are accessible from either side of the grinder. Even dressing each disc with its own separate dresser is push-button controlled. All controls, motors, starters and hydraulic units are enclosed within the rugged machine base.

Two More New BESLY Grinders

Model 910 Double Vertical Spindle Grinder for high production with small parts.

Model 711 Besly-Bowen Radial Head Grinder fully mechanized for automation.

SEE THEM AT THE MACHINE TOOL SHOW

Sealed Spindle Quill Construction

The grinder is equipped with Besly exclusive Sealed Spindle Quill construction which replaces old-fashioned ways with their problems of wear and inaccuracy. Quill construction also permits smooth, accurate adjustment of the abrasive discs and avoids transmitting motor vibration to the grinding spindle.

Fast Feed

High speed feeding is achieved through a simple electromagnetic pick-off disc which supplies work to the grinder in a continuous stream. Design of the machine has cut down-time for dressing, disc changing and set-up to one third of that required by other grinders.

Will Be Shown for
First Time at
Booth No. 911



BESLY-WELLES CORPORATION

Established as Charles H. Besly and Company in 1875
112 DEARBORN AVENUE, BELOIT, WISCONSIN

Besly Grinders and Accessories • Besly Taps, Drills, Reamers, End Mills •
Besly-Titan Abrasive Wheels

CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).
National Twist Drill & Tl. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
du Mont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich. (Thread).
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
National Twist Drill & Tl. Co., Rochester, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CUTTERS, Rotary

See Files & Burrs Rotary


CUTTING COMPOUNDS

See Compounds, Cutting, grinding, Etc.

CUTTING AND GRINDING FLUIDS

Cincinnati Milling Products Div., Cincinnati
Milling Machine Co., Cincinnati, Ohio.
Cimcoal Div., Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

(Continued on page 296)



**IT'S QUIET
ON THE MEZZANINE
...WHILE THE MEN BELOW**

rivet

...NOT 15 FEET AWAY!

This is a riveting line at the Irving Subway Grating Co., Long Island City, New York. Yet you cannot hear the riveting! Why? Because it's done with Hannifin "Hy-Power," the modern cold-squeeze riveting method.

Compact "Hy-Power" Portable Yoke Riveters quietly exert the force. The power is supplied by "Hy-Power" Hydraulic Pressure Generators (you see them right up there beside the man who is consulting the files) . . . compact, single units that include motor, pump, oil reservoir, control valves and high pressure intensifier.

HOW TO REDUCE YOUR RIVETING COSTS

Do it the "silent squeeze" way with Hannifin portable and stationary yoke riveters which are available in capacities from $7\frac{1}{2}$ to 100 tons (more in multiple). It's a fast method. It's a method that assures complete uniformity of every rivet. It's a safe method; for while a touch of a button starts the ram, the stroke may be interrupted and the ram reversed at any point in the cycle, simply by releasing the control button.

See your Hannifin representative who will demonstrate why "Hy-Power" riveting and punching equipment has a place in your production picture.

WRITE FOR BULLETIN 150

The complete story of Hannifin "Hy-Power" Hydraulics. Your copy sent on request.



do ALL you can do . . . with

HANNIFIN

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves
Hannifin Corporation, 509 S. Wolf Rd., Des Plaines, Ill.

production begins with



Columbus Die- Tool

Get production off to a profitable start! Use Columbus Die-Tool engineered tools. Jigs, Fixtures, and Special Machinery individually designed and built to produce your product alone . . . at a rate to match your production schedule. That's production economy! That's the wisdom of CDT special machinery! That's how Columbus Die-Tool can put your production on a profitable basis. Columbus Die-Tool are specialists in building special tools, jigs, fixtures and machinery . . . have been for over 46 years. Talk over your special problems with us. Absolutely no obligation. Write today.

Columbus Die-Tool AND MACHINE COMPANY

P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Manufacturers of

JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

Everybody
talks about *Quality*
Quality
Quality
Quality
Quality



At "CHICAGO" we DO something about it!

- Metallurgical Control of raw materials
- Statistical quality control regulates all manufacturing operations
- Carbon restoration method of heat treatment eliminates decarb on heat treated products.

Chicago Screws will assemble faster, with fewer rejects, and with a measurable reduction in costs.

Progressive action plus better methods of manufacture have kept "Chicago" out in front for 83 years.

"Chicago" Products are carried in stock by your favorite service-conscious Industrial Supply Distributor. Call him today. He can serve you promptly from his complete stocks—whether it be a package or a carload.

404

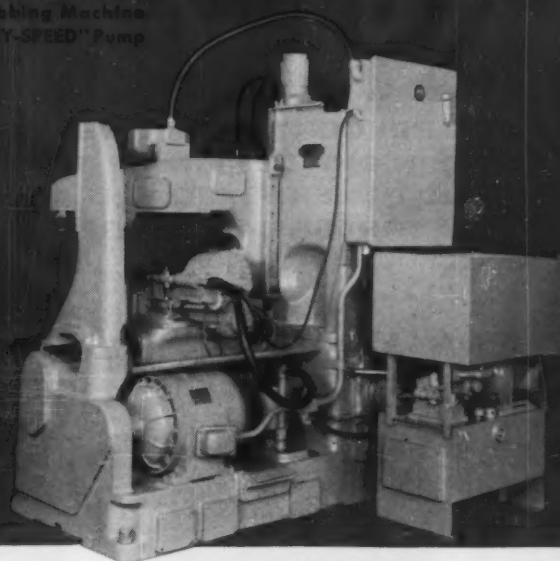
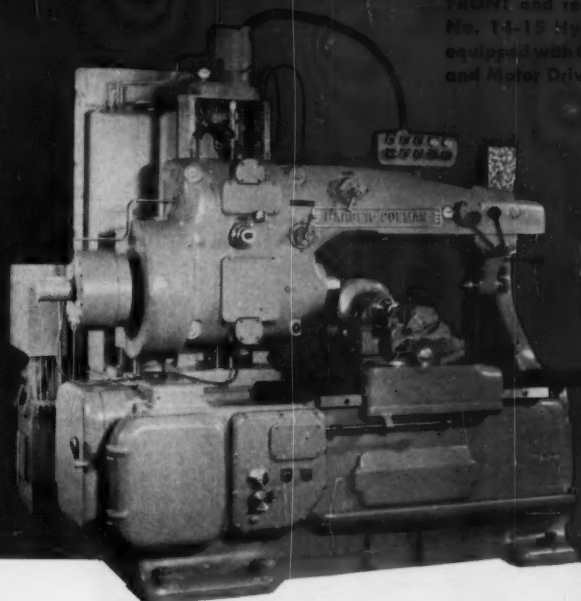
CHICAGO SCREWS

The CHICAGO
SCREW COMPANY

ESTABLISHED 1872
2807 Washington Boulevard
Bellwood, Illinois

The complete Chicago "Safety Plus" line includes in alloy steel: Socket Set Screws • Socket Head Cap Screws • Socket Stripper Bolts • Square Head Dog Point Set Screws • Socket Pipe Plugs • Flat Head Socket Cap Screws • Dowel Pins • Hexagon Keys and Key Kits • Also Socket Set Screws and Socket Head Cap Screws in Stainless. The complete "Chicago" line of Standard Products includes: Hexagon Head Cap Screws in steel—bright and Grade 5, heat treated, also in brass and stainless • Square Head and Headless Set Screws • Taper Pins • Steel Studs • Flat and Fillister Head Steel Cap Screws • Hexagon Nuts in steel, brass and stainless.

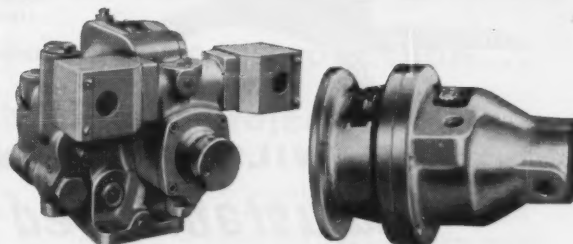
FRONT and rear views of Barber-Colman No. 14-15 Hydraulic Hobbing Machine equipped with Oilgear "ANY-SPEED" Pump and Motor Drive Feed.



ANOTHER TRIUMPH IN MACHINE DESIGN THAT USES OILGEAR "ANY-SPEED" DRIVE FEEDS

Barber-Colman's new high-speed hobbing machine may be totally different from the machines you build. But the machine design problems they encountered in developing this machine could very well be your problems. Among the problems encountered was that of feed. To solve this problem, Barber-Colman selected Oilgear Fluid Power Feeds. These feeds give them the infinitely variable output to provide a hobbing feed range of .020" to 1" per minute. In addition, they provide a far more constant hobbing feed despite changes in load or system temperatures. They also provide cushioned, positive, precise, fast-acting electro-hydraulic control of feed, rapid traverse, and stop through automatic switches. Finally, they provide power for operating ten auxiliary cylinders and three valves. One Oilgear type AX-311 Pump supplies fluid power for the entire machine.

You have much to gain if you stop a moment and ask: "Why are leading machine and machine tool builders turning to Oilgear? Am I missing an opportunity to improve machine performance?" Why don't you compare your machine needs with what Oilgear "ANY-SPEED" Drives and Feeds can provide? You can rest assured that we will recommend our product



**Type AX-311 PUMP and Type H-311 MOTOR
OILGEAR "ANY-SPEED" DRIVE FEED**

only when it is to your advantage. Tell us your needs. We'll give you a specific appraisal of the possibilities. Write now. **THE OILGEAR COMPANY, 1569 W. Pierce Street, Milwaukee 4, Wisconsin.**

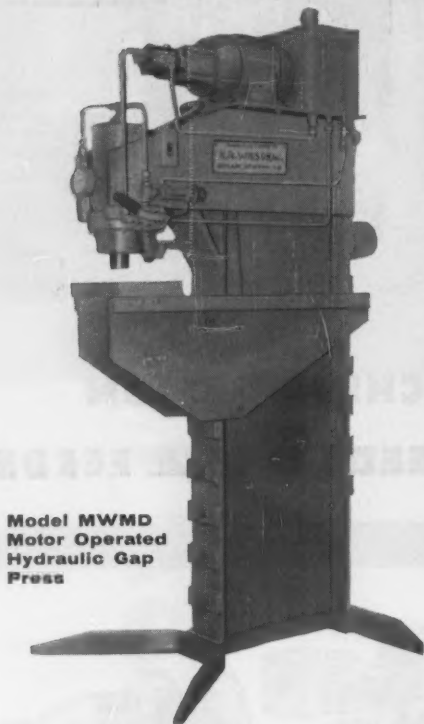


**PIONEERS...NOW THREE PLANTS
FOR FLUID POWER
PUMPS, MOTORS, TRANSMISSIONS, CYLINDERS & VALVES**

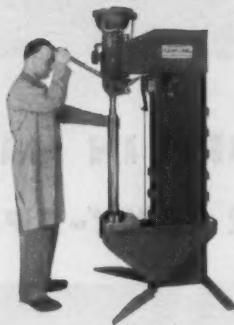
See this press at Booth 114, Chicago Coliseum Machinery Show

NOTICE!

**A REVOLUTIONARY NEW CONCEPT
USED IN THE DESIGN OF THESE PRESSES.
ALL OTHER FIXED BED MECHANICAL
PRESSES NOW OBSOLETE!**



**Model MWMD
Motor Operated
Hydraulic Gap
Press**



**Model MWAQ
Hand-Air-Oil
Operated
Hydraulic Gap
Press**

*U. S. Patents Pending
and Applied for.

K. R. WILSON'S NEW Adjustable Bed HYDRAULIC GAP PRESSES

We mean it. The amazing new K. R. Wilson Adjustable Gap Presses have set a new standard in versatility of operation and money saving efficiency. Here's the story.

• **Complete Versatility.** Handles bending, straightening, pressing and forming jobs in either maintenance or production. Fastest set-ups possible.

• **Press adjusts to the work on all jobs.** Easy, hand-operated geared winch moves bed from 4" to 30" daylight (with ram up) at 6" increments.

• **Exclusive K. R. Wilson TILT-LOCK* system** holds bed securely in each position. No extra adjustments needed.

• **Fast action - no lost motion or labor.** Ram lowers to work with cylinder preloaded ready to apply pressure immediately.

• **15 and 25 ton capacities** available in hand-air-oil or power-driven models. Choose from 8 standard models or have K. R. Wilson's engineers modify to your particular requirements.

• **And low in cost!** These fully hydraulic presses, with adjustable bed, cost no more than ordinary fixed bed mechanical presses.

These are the facts, now get the details on K. R. Wilson's amazing Adjustable Bed Gap Presses. WRITE FOR BULLETIN No. 79 TODAY!

K. R. WILSON, Inc.
HYDRAULICS DIVISION
202 MILL ST. ARCADE, NEW YORK, U.S.A.

Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).
Consolidated Mch. Tool Co., Rochester, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Johnson Mfg. Co., Albion, Mich.
Landis Machine Co., Waynesboro, Pa. (Pipe).
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).

CUTTING-OFF MACHINES, Abrasive Wheel

Campbell Machine Div., American Chain & Cable, Bridgeport, Conn.
Hamilton Div., The Lodge & Shipley Co., Hamilton 1, Ohio.
Wallace Tube Co., 1304-08 Diversey Pkwy., Chicago, Ill.

CUTTING-OFF MACHINES, Cold Saw See Sewing Machines, Circular

CUTTING-OFF MACHINES, Metal Band Saws

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Grab, Inc., Grafton, Wis.

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

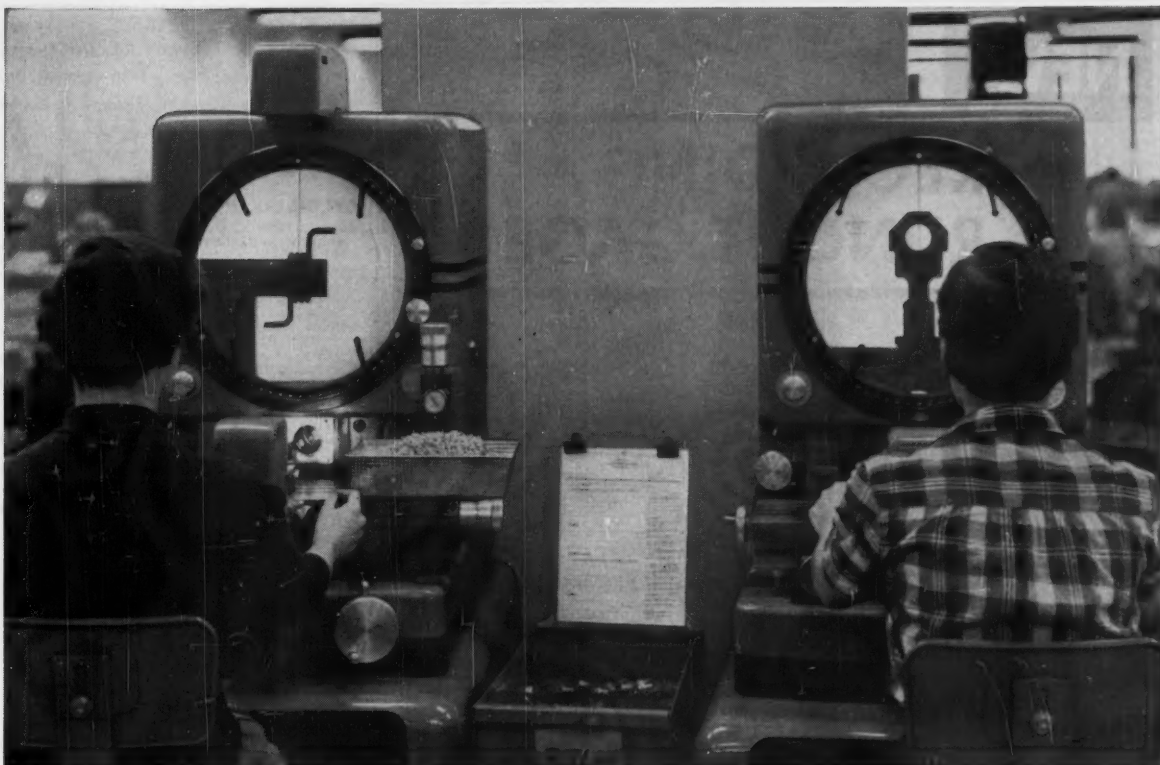
CUTTING-OFF WHEELS, Abrasive

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

Baker Bros., Inc., Sta. F, Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

(Continued on page 298)



Girls at the Allen-Bradley Company, leading makers of electrical equipment, use Kodak Contour Projectors to inspect incoming precision parts quickly and accurately.

To speed parts from receiving dock to production ... Allen-Bradley uses Kodak Contour Projectors

Receiving inspection can be a bottleneck, slowing the production operation when, on an average day, many separate shipments of component parts crowd the receiving room.

To avoid such a bottleneck and keep production lines moving, the Allen-Bradley Company combines statistical sampling methods with modern gaging equipment. Kodak Contour Projectors are used to check more than 400 different items, most having multiple dimensions and sample sizes of 35 or more pieces. Tolerances are held as close as .001".

Because optical gaging affords a check of several dimensions simultaneously, Allen-Bradley has cut inspection time dramatically: a typical part, requiring

minutes to gage mechanically, now is checked in 12 seconds optically.

The result: No unnecessary delays—parts are quickly cleared for production. And quality control has improved.

You'll find that Kodak Contour Projectors are profitable wherever you need fast, accurate, complete inspection or measurement of almost any sort of part—simple or complex, large or small. And there are models to fit every need from the large Model 30 to the bench Model 8. To learn more about optical gaging and how it can help solve your problems, send for our illustrated booklet, "Kodak Contour Projectors." Use the coupon below.

the KODAK CONTOUR PROJECTOR

EASTMAN KODAK COMPANY

Special Products Sales Division, Rochester 4, N. Y.

- ☐ Please send me a copy of your booklet, "Kodak Contour Projectors."
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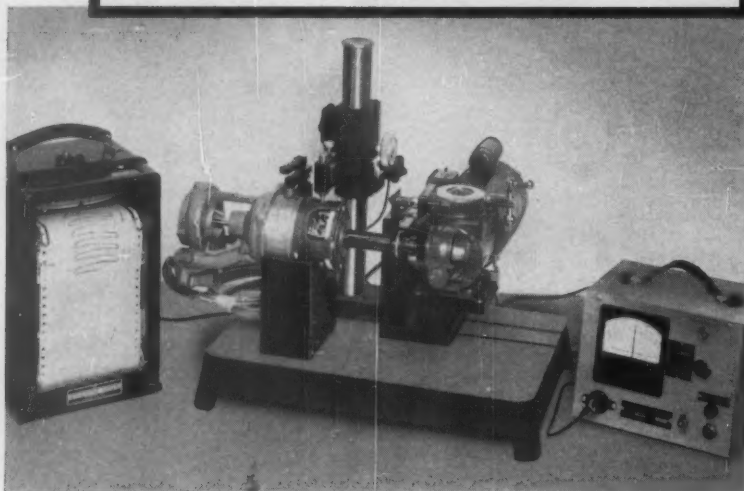
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COMPANY _____

STREET _____

CITY _____ STATE _____
(Zone)

Kodak
TRADE-MARK

NEW!**RECORDING
RUNOUT GAGE**

GIVES CHART RECORD of runout of rotating parts in assembled units. Two sensitivities are provided — .000010" and .000050" per chart paper division — and can be used interchangeably at will.

ADAPTABLE. Equipment shown is checking overall runout and bar-to-bar step measurement of commutator in electric motor. Can be furnished for checking runout of machine tool spindles, fan shafts, pump shafts, etc. — wherever the rotating part can be reached with an external probe.

DEPENDABLE. Frictionless gage head movement, drift-free amplifier and high-precision recorder assure consistent accuracy.

FREE BULLETIN 553 gives details. — Other bulletins describe Cleveland automatic gaging and sorting equipment — electronic gages for production, tool room and gage room use — recording and control applications. Write for them!

We invite your attendance at Booth 817, Production Engineering Show, Chicago.

CLEVELAND INSTRUMENT COMPANY
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Cleveland**ELECTRONIC
GAGING
EQUIPMENT****CYLINDERS, Air**

Hannafin Corp., 501 Wolf Rd., Des Plaines, Ill.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

CYLINDERS, Hydraulic

Barnes, John S., Corp., Rockford, Ill.
Hannafin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co. Inc., 810 Center Ave., Logansport, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Milwaukee St., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

CYLINDERS, Pneumatic

Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.

DEALERS, Machinery

Falk Machinery Co., 18 Ward St., Rochester, N. Y.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

DEMAGNETIZERS

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Heald Mch. Co., 10 New Bond St., Worcester 6, Mass.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Taft-Pierce Mfg. Co., Woonsocket, R. I.
Walker, O. S. Inc., Worcester, Mass.

DESIGNERS, Machine and Tool

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Hartford Specialty Mchry. Co., 287 Homestead St., Hartford, Conn.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIAMONDS AND DIAMOND TOOLS

Christensen Diamond Prod., 1937 S. Second West, Salt Lake City, Utah
Precision Diamond Tool Co., 102 South Grove Ave., Elgin, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

DIE-CASTING

See Castings, Die

DIE-CASTING MACHINES

Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engineering Corp., Kenmore Station Buffalo, N. Y.

(Continued on page 300)

**New!
Revolutionary!**

Colonial ONE-WAY Surface Broacher



**"Eliminates" Return-Stroke
"Eliminates" End of Stroke
"Doubles" Length of Stroke**

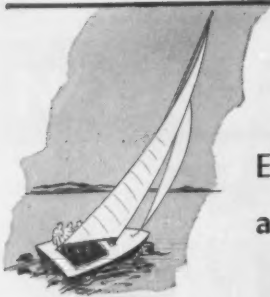
For complete information on the new Colonial ONE-WAY surface broacher, ask for Bulletin VC-55. See it in operation at the Machine Tool Show.

**MECHANICAL DRIVE
AC MOTOR
VARIABLE SPEED
HYDRAULIC OR
MECHANICAL FIXTURES
CARBIDE OR
HSS BROACHES
NO PIT REQUIRED
FOR LOW CEILING
LONGER TOOL LIFE**


**EXTREME ACCURACY
GUARANTEED
STROKE LENGTH
UP TO 200 INCHES
SPEEDS UP TO 50 FEET/MIN.
ONE LONG STROKE—
ONE PART
OR
MULTIPLE SHORT STROKES
ON MULTIPLE PARTS
CONTINUOUS OPERATION**



UNIFIED BROACHING is the key to successful broaching



Everyone recognizes this
as a sign of smooth sailing...

And smart gear users know
this  is the sign of good gears
made to your specifications.

May We Send You Our Brochure?



"Gears... Good Gears Only"

THE CINCINNATI GEAR CO. • CINCINNATI 27, OHIO



STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

This die head is unique

THERE IS NO OTHER LIKE IT

It cuts threads with insert chasers. These are, in reality, small sections of the business end of large and expensive chasers, but with this important difference: *their cost is so low they can be even thrown away when dull.* For example, for less than \$40 you can get a dozen sets of insert chasers, each set ground ready to go. Change now to insert chaser die heads and watch your performance improve. "SELECTING THE PROPER DIE HEAD FOR THE JOB" sent free on request.

THE EASTERN MACHINE SCREW CORPORATION 23-43 Barclay St., New Haven, Conn.

DIE CUSHIONS

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, Ill.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Version Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.

DIE INSERTS, Carbide

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DIEMAKERS' SUPPLIES

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DIEMAKING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Cincinnati Milling Mach. Co., Oakley, Cincinnati 9, Ohio.
Grob, Inc., Grafton, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.
Oliver Instrument Co., 1410 E. Moume St., Adrian, Mich.

DIE SETS, Standard

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 225 N. 18th St., Ampere, N. J.
Wales-Strippert Corp., North Tonawanda, N. Y.

DIE-SINKING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Turchon Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIE-SINKING PRESSES

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Kearney & Trecker Corp., Milwaukee, Wis.
Version Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.

DIE STOCKS

See Stocks, Die

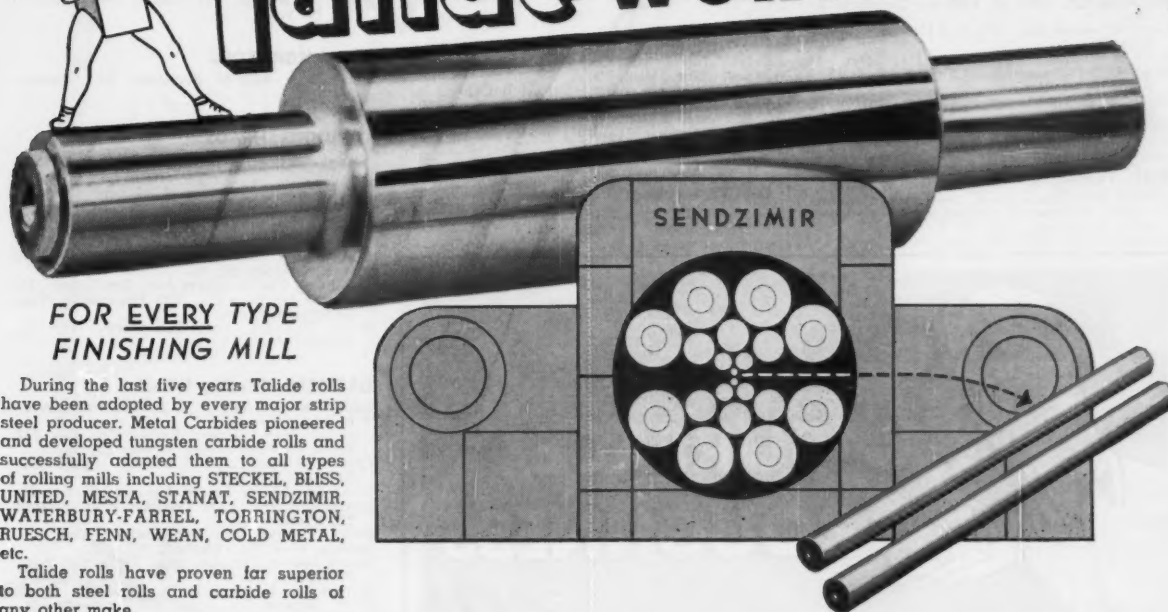
DIES, Sheet Metal, Etc.

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Carboloy Dept. General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die-Tool & Mach. Co., 955 Cleveland Ave., Columbus, Ohio.
Dreis & Krupp Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Mch. Co., Bridgeton, N. J.
Metal Carbides Corp., Youngstown, Ohio.
Niagara Mch. & Tool Wks., 683 Northland Ave., Buffalo, N. Y.
Shelfield Corp., 721 Springfield St., Dayton 1, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Version Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.
Wales-Strippert Corp., North Tonawanda, N. Y.
Waltham Mch. Wks., Newton St., Waltham, Mass.

(Continued on page 302)



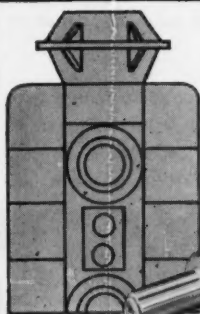
ALL ROLLING MILLS NOW USE Talide WORK ROLLS



FOR EVERY TYPE FINISHING MILL

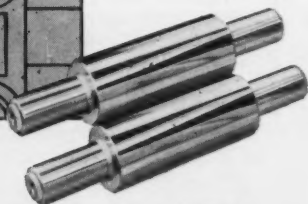
During the last five years Talide rolls have been adopted by every major strip steel producer. Metal Carbides pioneered and developed tungsten carbide rolls and successfully adapted them to all types of rolling mills including STECKEL, BLISS, UNITED, MESTA, STANAT, SENDZIMIR, WATERBURY-FARREL, TORRINGTON, RUESCH, FENN, WEAN, COLD METAL, etc.

Talide rolls have proven far superior to both steel rolls and carbide rolls of any other make.



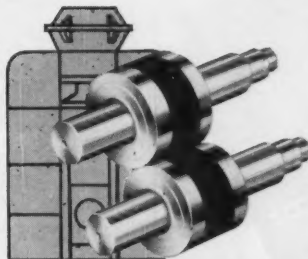
168 to 7 hours

Leading Ohio strip steel producer averages 750 coils of various types and analyses between grinds, enabling them to operate their cold rolling mill continuously without roll changes for 7 days, 3 turns per day. Previous steel rolls used averaged 6-8 hours, necessitating 2 or 4 roll changes per day with considerable downtime.



210 to 5 days

Large Mid-Western producer of chrome-nickel alloy flat wire is averaging 7 months' continuous service between grinds compared to 5 days average run with steel rolls. Among other advantages, customer reports improved surface finish adds to sales appeal of finished product, fewer anneals are required to produce desired reduction, and wire runs cooler, resulting in less oxidation.



ROLL REPAIRING

Broken or damaged carbide rolls can be re-worked to first class condition with all defects eliminated at one-half original cost. Only Metal Carbides offers this service—because of its exclusive hot press method.

Send for new 84-page catalog 55-G

Talide work rolls are ultra-hard, extremely dense, and porous-free. Manufactured from highest purity tungsten carbide powders, the surface finish of a Talide roll is smoother than one micro-inch. Hard as a diamond, it will take a "bigger bite" than a steel roll. Strip steel of all analyses can be rolled down to thinner gauge, with more accuracy, greater reductions and with fewer anneals than possible with any other roll.

All users of Sendzimir rolling mills have adopted Talide work rolls because operating results have been phenomenal, far surpassing all expectations. The higher initial cost of Talide rolls is offset many times by the very substantial savings realized in less downtime, fewer regrinds, reduced scrap, reduced strain and stress load on back-up rolls, bearings and mill housings.

Tremendous production runs are commonplace with Talide rolls with mill after mill reporting increased tonnage-runs between roll changes of 278-1, 179-1, 82-1, etc. Metal Carbides Corporation, Youngstown 7, Ohio.



SPECIAL DIAMOND WHEEL for ROLL GRINDING

The Superset diamond grinding wheel was specially developed for grinding carbide rolls to highest possible surface finish and luster. Made of 4-8 micron size diamond dust, it imparts a surface finish far superior to any other commercial wheel. Available in sizes up to 25" diameter.



HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • CERMETS • HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
 Card, S. W., Mfg., Mansfield, Mass.
 Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
 Eastern Mch. Screw Corp., New Haven, Conn.
 Geometric Tool Co., Westville Station, New Haven 15, Conn.
 Greenfield Tap & Die Corp., Greenfield, Mass.
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
 National Acme Co., 170 E. 131st St., Cleveland, Ohio.
 Pratt & Whitney, West Hartford 1, Conn.
 Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
 Threadwell Tap & Die Co., Greenfield, Mass.
 Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn.
 Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.

Geometric Tool Co., Westville Station, New Haven 45, Conn.
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
 Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
 Landis Mch. Co., Waynesboro, Pa.
 National Acme Co., 170 E. 131st St., Cleveland, Ohio.
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

DIES, Thread Rolling

Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
 Pratt & Whitney, West Hartford 1, Conn.
 Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

DISCS, Abrasives

Besley-Welles Corp. (Abrasives Div.) 20 N. Wacker Drive, Chicago 6, Ill.

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
 Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
 Macklin Co., 2925 Wildwood Ave., Jackson, Mich.
 Norton Co., 1 New Bond St., Worcester, Mass.
 Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
 Smit, J. K. & Sons, Inc., Murray Hill, N. J.
 Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

DISINTEGRATORS

Elax Corp., 602 N. Rochester Rd., Clawson, Mich.

DIVIDING HEADS

See Indexing and Spacing Equipment

DOWELL PINS

Ollen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
 Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
 Product Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
 U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DRESSERS, Grinding Wheel

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
 Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
 Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
 Metal Carbides Corp., Youngstown, Ohio.
 Meyers, W. F. Co., Bedford, Ind.
 Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
 Norton Co., 1 New Bond St., Worcester, Mass.
 Sherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
 Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.

DRIFTS, DRILL

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
 Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
 Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL HEADS, Multiple Spindle

Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
 Barnes Drill Co., 814 Chestnut, Rockford, Ill.
 Buffalo Forge Co., 400 Broadway, Buffalo, N. Y.
 Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
 Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio.
 Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
 Etto Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich.
 Govro-Nelson Co., Detroit 8, Mich.
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
 Jarvis Corp., Middletown, Conn.
 Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
 Moline Tool Co., 102 20th St., Moline, Ill.
 Snyder Tool & Engrg. Co., 3400 Lafayette, Detroit 7, Mich.
 Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
 United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
 Zager Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
 Kingsbury Mch. Tool Corp., Keene, N. H.
 Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
 Morris Machine Tool Co., Inc., 946-H Harriet St., Cincinnati 3, Ohio.
 Rehner-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
 Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
 (Continued on page 304)



Then you'll want **FREE BULLETIN L21. It tells...**

- **How to establish roughness specifications**
 — for parts in production, and
 — for parts of new design.
- **How to show roughness specifications**
 on working drawings and shop prints.
- **Practical benefits** gained by specifying surface roughness.

This bulletin also defines "surface roughness." It gives practical pointers on MEASURING surface roughness in the shop — and briefly tells why most plants use the PROFILOMETER for doing this.

Write today for your free copy. Ask for **Bulletin L21.**



Profilometer is a registered trade mark

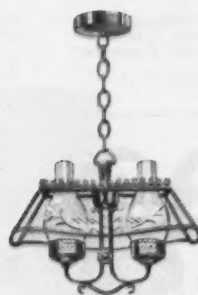


**MICROMETRICAL
MANUFACTURING COMPANY**

329 S. MAIN ST.

ANN ARBOR, MICHIGAN

*If you're eating your heart out
over polishing costs---read this!*



Skyrocketing enthusiasm of America's homeowners for high-quality solid-brass lighting fixtures created a temporary bottleneck in the polishing room of Globe Lighting Products, Inc., one of the leaders in the field. This production problem coincided with the introduction of Formbrite* to the metal-working industry a couple of years ago.

Globe's acceptance of this easy-to-polish fine-grain drawing brass was immediate and enthusiastic. Results were highly successful from the very beginning. Work pile-ups in the polishing room were eliminated and polishing costs were cut in half on many items (see typical examples below). In addition, Globe learned, as have many others, that Formbrite provides a more lustrous finish—is harder, stronger, springier and more scratch-resistant, yet has remarkable ductility for forming and drawing operations.

Surprisingly, Formbrite doesn't cost a penny more than ordinary drawing brass. Why not pass the good news along to those who head up your engineering, design or production departments? Ask them to write for booklet B-39 ... or phone for a sales representative ... or request a free sample of Formbrite to try in your own shop. Address: The American Brass Company, General Offices, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

5580

*Reg. U. S. Pat. Off.

Parts illustrated are approximately three-quarters actual size.

48% saving

5/16 x .062" round-edge Formbrite strip in this scroll eliminated a before-bending polishing operation.

45% saving

After forming, this Formbrite channel edging is simply bright dipped, color buffed, degreased, lacquered. That's all!

55% saving

This hard-to-handle ornamental banding now gets only a simple color buff, saving as much as the cost of the metal.

26% saving

Tens of thousands of these drawn canopies, socket cups, etc., have been made of time-and-cost-saving Formbrite.

Formbrite

FINE-GRAIN DRAWING BRASS
an ANACONDA product
made by The American Brass Company

DRILL SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
 Cleveland Twist Drill Co., Cleveland, Ohio.
 Greenfield Tap & Die Corp., Greenfield, Mass.
 National Twist Drill & Tool Co., Rochester, Mich.
 Pratt & Whitney, West Hartford 1, Conn.
 Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
 Union Twist Drill Co., Athol, Mass.
 Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
 Greenfield Tap & Die Corp., Greenfield, Mass.
 National Twist Drill & Tool Co., Rochester, Mich.
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

Union Twist Drill Co., Athol, Mass.
 Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLING MACHINES, Automatic

Avey Drilling Mch., Co., 26 E. Third St., Covington, Ky.
 Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
 Barnes Drill Co., 814 Chestnut Rockford, Ill.
 Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
 Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
 Bodine Corp., Mt. Grove St., Bridgeport, Conn.
 Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
 Consolidated Mch. Tool Corp., Rochester, N. Y.
 Cross Co., 3250 Bellevue, Detroit 7, Mich.
 Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
 Kingsbury Mch. Tool Corp., Keene, N. H.

Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
 Morris Machine Tool Co., 946-M Harriet St., Cincinnati 3, Ohio.
 National Automatic Tool Co., Inc., 5. 7th and N. Sts., Richmond, Ind.
 Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
 Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
 Wales-Strippet Corp., North Tonawanda, N. Y.
 Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Bench

Avey Drilling Mch. Co., 126 E. Third St., Covington, Ky.
 Buffalo Forge Co., 490 Broadway, Buffalo.
 Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio.
 Edlund Machinery Co., Cortland, N. Y.
 Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
 Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

DRILLING MACHINES, Boiler

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
 Foote-Burr Co., 1300 St. Clair Ave., Cleveland.

DRILLING MACHINES, Deep Hole

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
 Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
 National Automatic Tool Co., Inc., 5. 7th and N. Sts., Richmond, Ind.
 Pratt & Whitney, West Hartford 1, Conn.
 Wales-Strippet Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Gang

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
 Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
 Barnes Drill Co., 814 Chestnut, Rockford, Ill.
 Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
 Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
 Cleereman Mch. Tool Co., Green Bay, Wis.
 Consolidated Mch. Tool Corp., Rochester, N. Y.
 Edlund Machinery Co., Cortland, N. Y.
 Foote-Burr Co., 1300 St. Clair Ave., Cleveland.
 Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
 Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
 Maline Tool Co., 102 20th St., Moline, Ill.
 Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
 National Automatic Tool Co., Inc., 5. 7th and N. Sts., Richmond, Ind.
 Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

DRILLING MACHINES, Horiz.

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
 Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
 Barnes Drill Co., 814 Chestnut, Rockford, Ill.
 Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.
 Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
 Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
 Consolidated Mch. Tool Corp., Rochester, N. Y.
 Cross Co., 3250 Bellevue, Detroit 7, Mich.
 Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
 Edlund Machinery Co., Cortland, N. Y.
 Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
 Kingsbury Mch. Tool Corp., Keene, N. H.

(Continued on page 306)

ROCKFORD**UNIFORM
PRESSURE****COMPACT DESIGN****POWERFUL PULL****SMOOTH ENGAGEMENT****UNIFORM PRESSURE*****FINE ADJUSTMENT****ACCURATE BALANCE****LONG SERVICE LIFE**

*The driving pressure of this ROCKFORD toggle-action over-center CLUTCH is uniformly distributed—directly opposite the facing. The drive plate slides along an accurately machined collar, thus applying the pressure evenly. Plates are steel and facing is firm-grip, non-grab, long-life material.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.



ROCKFORD CLUTCH DIVISION BORG-WARNER
 A 410 Catherine Street, Rockford, Illinois, U.S.A. A

CLUTCHES

FACTS

about

NEW DEPARTURE BALL BEARINGS

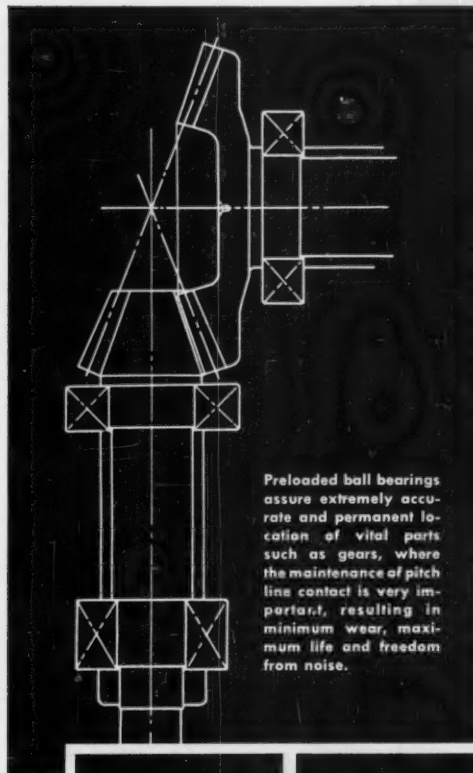


How Preloading Pays Off in Accuracy!

New Departure pioneered preloading to give you a new measure of machine accuracy! This accuracy, due to increased bearing rigidity, pays off in high-precision machines, where the slightest deflection caused by work loads on moving parts can be crucial to the ultimate performance of the machine.

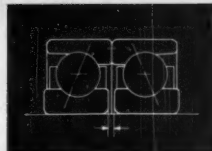
By placing a predetermined internal load on the bearing, either at the time of manufacture or at installation, deflection due to the work load is greatly reduced. This means not only that machine accuracy is greatly improved, but that the ball bearing characteristics of low torque operation and long life are fully retained.

If you are seeking a solution to your bearing problem, call on New Departure for the answer. You will benefit from more than 50 years' experience in bearing design, testing and manufacture.

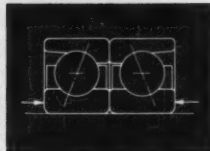


Preloaded ball bearings assure extremely accurate and permanent location of vital parts such as gears, where the maintenance of pitch line contact is very important, resulting in minimum wear, maximum life and freedom from noise.

Send for Booklet BA-6
on ball bearing application



Preload is predetermined, then accurately obtained by grinding Duplex bearing faces so that an exact and fixed compression will take place when mounted.



A Duplex bearing, in effect, becomes a preloaded double-row bearing capable of holding parts within close limits, both radially and axially.



Duplex bearings may be mounted in several different ways to suit load conditions. In each case, extra rigidity of shaft centering is obtained by preloading.



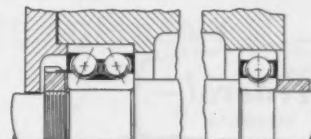
The benefits of preloading can be seen from this deflection curve. The double-row ball bearing referred to here is the most rigid type of unit bearing made to resist loads from any direction.

Typical Application of New Departure Preloaded Ball Bearings



The extreme resistance to deflection and the freedom from wear offered by the New Departure double-row bearing make it a favorite wherever exact location of parts under combined loads must be assured not only initially, but throughout long usage.

In this typical application the double row, solidly supported against suitable housing and shaft shoulders and with a "floated" single row at the other end, provides one of the best general-duty mountings where considerable thrust is present.



NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

For more information on products advertised, use Inquiry Card, page 245

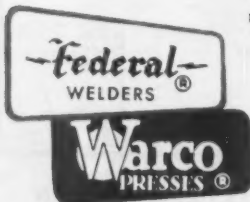
MACHINERY, August, 1955—305



"This Warco's A Real Press" —

says experienced Press Operator

"I've worked medium and light presses for more than eight years," says press operator John Gallik, of the Midland Steel Products Co., Cleveland, "and this Warco 200-ton OBI is a real piece of machinery." Gallik's employers, the Midland people, one of the nation's foremost producers of automobile and truck frames, go along with the operator's opinion. Nine years ago Midland bought their first Warco, and on the basis of performance have since added 49 others in various types and sizes. Midland, like so many of the nation's top manufacturers, finds one Warco invariably leads to another, and their press operators are happy about it.



The Federal Machine and Welder Company
WARREN, OHIO

Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch Tool Co., 2531 11th St., Rockford, Ill.

DRILLING MACHINES, Horizontal Portable

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.

DRILLING MACHINES, Inverted

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

DRILLING MACHINES, Multiple Center Column Type

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Spindle

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Edlund Machinery Co., Cortland, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Greenlee Bros. & Co., 12th and Columbia Ave., Rockford, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

(Continued on page 308)

BROACHING without CHATTER

is easy, on the **LAPOINTE** VUE-7

the world's first **ELECTRO-MOTIVE POWERED
pull-up BROACHING MACHINE**



Spiral gear
before and after
being broached

Built for high production, and using two identical broaches rotated in true synchronism by a sturdy lead bar, this new LAPOINTE machine broaches helical internal gear automotive parts two at a time, at a rate of 320 parts per hour . . . at 80% efficiency!

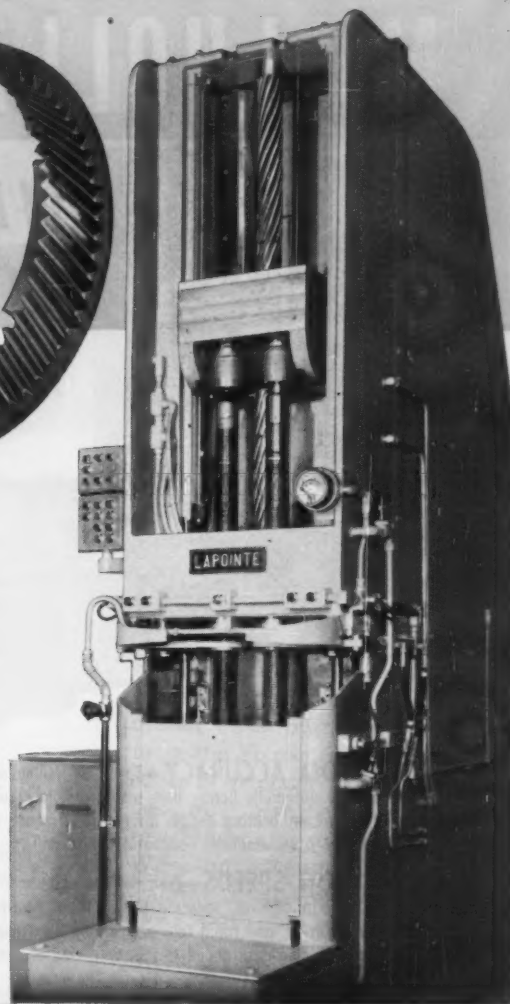
No wonder that it broaches without chatter: it has massive, quiet gears . . . a heavy, rigid frame . . . and electro-motive drive! No wonder, either, that because of these features the work is more accurate, and tool life is increased 400% to 500% between grinds!

LAPOINTE VUE-7

for broaching speeds of 10 to 100 feet-per-minute.

Can be built in other types and sizes up to 50 tons.

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HUDSON
LAPOINTE
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THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

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American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
 Carlton Mch. Tool Co., 3000 Spring Grove Ave., Cincinnati 25, Ohio.
 Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
 Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
 Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio.
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
 Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio.
 Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
 Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
 Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
 Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLING MACHINES, Rail

See Drilling Machines, Gang

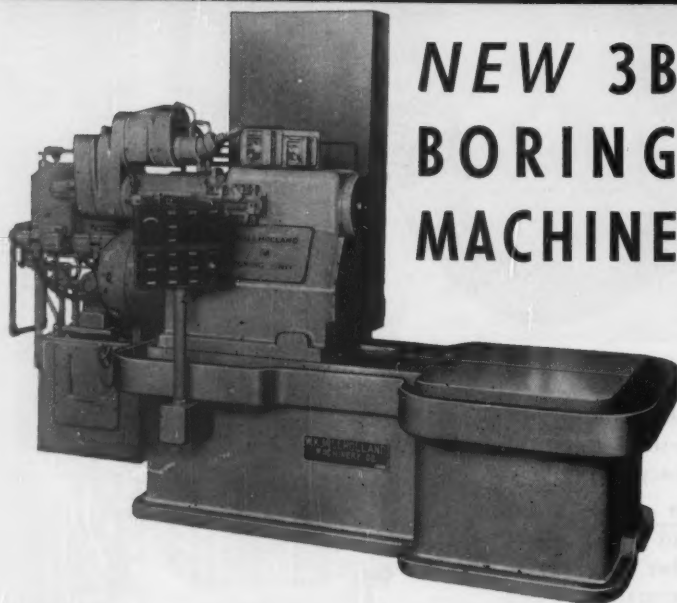
DRILLING MACHINES, Sensitive

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
 Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
 Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio.
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
 Edlund Machinery Co., Cortland, N. Y.
 Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio.
 Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
 National Automatic Tool Co., Inc., S. 7th and N. St., Richmond, Ind.
 Pratt & Whitney, West Hartford 1, Conn.
 Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
 Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
 Wales-Strippert Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Upright

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.

MILLHOLLAND



NEW 3B BORING MACHINE

TOOL ROOM ACCURACY—The new Millholland 3B Boring Machine uses a standard Automatic Boring Unit with completely automatic feed cycle. Millholland full precision bearing design insures performance to a degree of accuracy equal to that of a conventional horizontal boring mill.

PRODUCTION SPEEDS—Push button operation controls the completely automatic cycle. In addition, separate push buttons control rapid advance, coarse feed, fine feed, dwell, and rapid return. Hydraulic feed mechanism is infinitely adjustable. Machine table is arranged to take any kind of fixture.

LOW CAPITAL INVESTMENT—With the new 3B Boring Machine you can perform many jobs which formerly had to be put on a large and expensive boring mill. On short run jobs especially it will pay for itself in increased economy, efficiency and versatility.

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 Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
 Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
 Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
 Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio.
 Cleereman Mch. Tool Co., Green Bay, Wis.
 Consolidated Mch. Tool Corp., Rochester, N. Y.
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
 Edlund Machinery Co., Cortland, N. Y.
 Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
 Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
 Hartford Special Mchry Co., 287 Homestead St., Hartford, Conn.
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
 Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
 Moline Tool Co., 102 20th St., Moline, Ill.
 National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
 Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
 Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
 Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
 Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
 Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
 Wales-Strippert Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Wall, Radial

Cleveland Punch & Shear Works, 3817 St. Clair Ave., N.E., Cleveland, Ohio.
 Consolidated Mch. Tool Corp., Rochester, N. Y.

DRILLS, Center

The Atrax Co. (Carbide) 240 Day St., Newington 11, Conn.
 Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
 Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
 Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
 Greenfield Tap & Die Corp., Greenfield, Mass.
 National Twist Drill & Tool Co., Rochester, Mich.
 Union Twist Drill Co., Athol, Mass.
 Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Core

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
 Carbide Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
 Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
 Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
 Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
 Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
 McCroskey Tool Corp., 1938 Thomas St., Meadville, Pa.
 National Twist Drill & Tool Co., Rochester, Mich.
 Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
 Smit, J. K., & Sons, Inc., Murray Hill, N. J.
 Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
 Union Twist Drill Co., Athol, Mass.
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
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(Continued on page 312)



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See the completeness and diversification of the Kennametal line of sintered carbide tooling, which includes several thousand individual items available from stock at all times to help you do a better job on any type of machining operation . . . to help you cut tooling costs, step up production, reduce machine downtime.

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And we'll be glad to discuss your machining problems and how Kennametal can help you solve them.

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Be sure to see the complete line
of Kendex* Button Tools and K21 . . .
the New, Superior General Purpose
Steel Cutting Grade



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Kennametal makes available top quality sintered carbide inserts, brazed tools, button tools, clamp tools and accessories, with cutting edges in diversified grades of hardness, toughness, heat and corrosion resistance and other properties. Write for a copy of Kennametal Catalog 55 and of Characteristics Book B-111.

**Give your machines
the tools they deserve
...the BEST**

7209

With the **NEW Fosdick Jig Borer . . .**

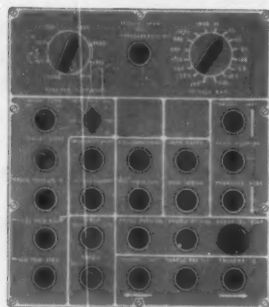
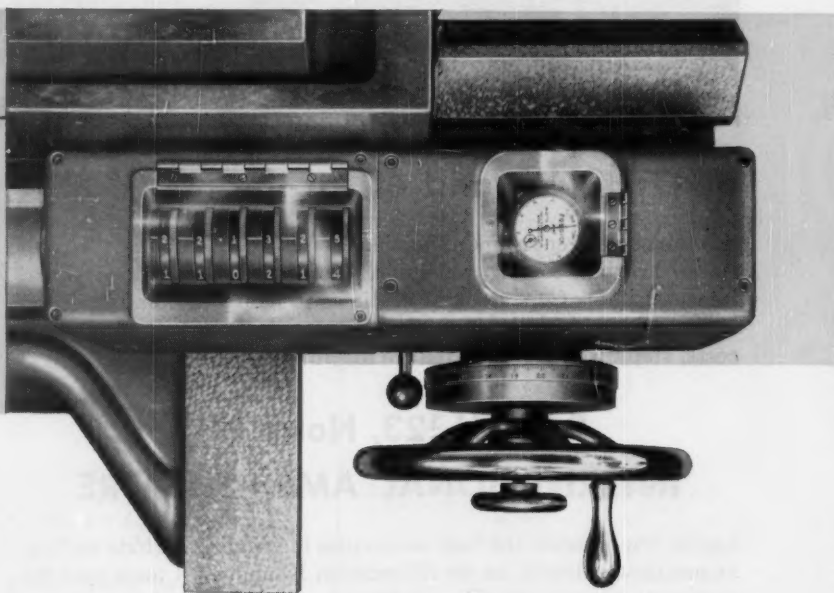
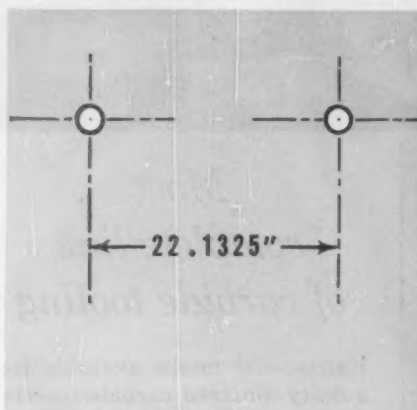
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Measuring!**

● This new and exclusive measuring system is the simplest, the most direct ever conceived for a jig borer! It will measure with precision to $\pm .0001''$. And the operator need not be highly skilled.

Dimensions from the blueprint are simply set on direct-reading drum dials, one for longitudinal, the other for transverse position. Easily-read numerical dials minimize errors. The finest Class 'A' gages . . . permanently sealed against dust and never handled by the operator . . . provide consistent precision.



Press a Button . . . Table and Saddle Position Automatically!

Once dials are set, press the positioning button. Table and saddle will automatically position themselves to the dimensions set on the dials. We guarantee accuracy of $\pm .0001''$!

In addition, push-button station controls spindle feeds and speeds; milling feeds to table and saddle; electric clamp to table and saddle; rapid traverse to table, saddle and quill; emergency stop.

NEED DRILLING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!

...to .0001"



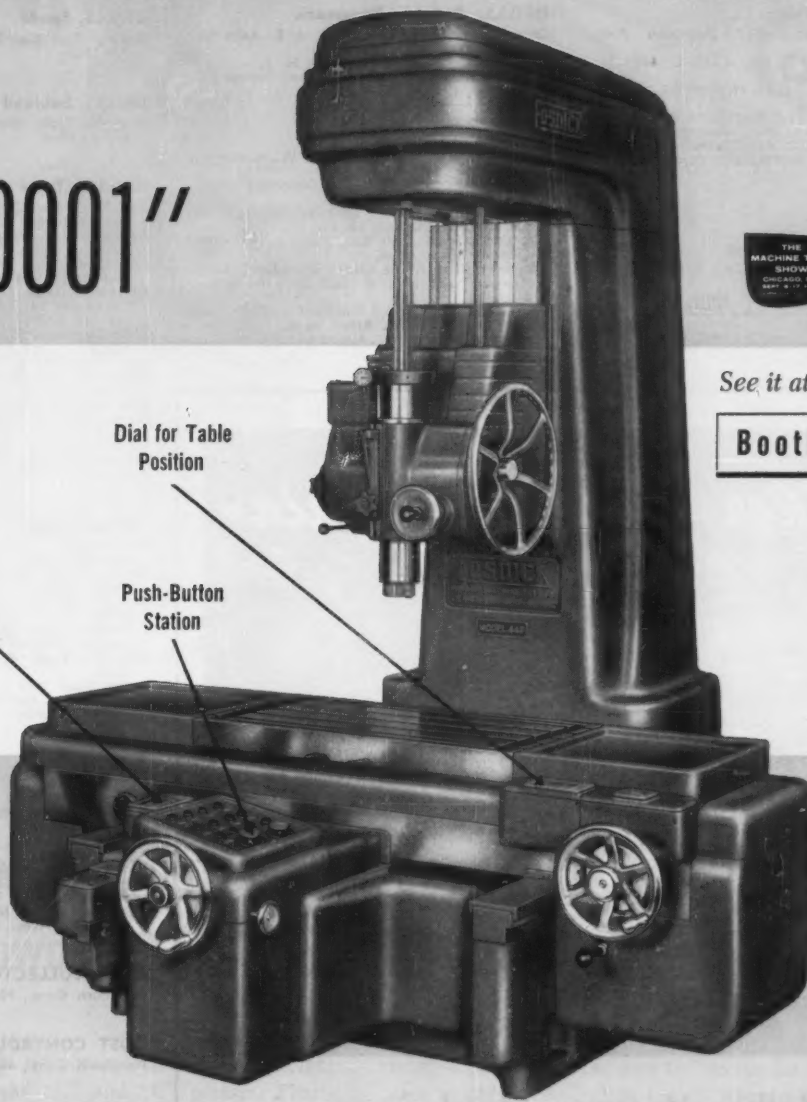
See it at the Show

Booth 1402

Dial for Saddle Position

Dial for Table Position

Push-Button Station



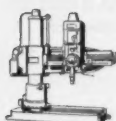
Like the scores of Fosdick Jig Borers in plants throughout the U. S., this new machine will perform consistently to $\pm .0001''$. . . in measured table and saddle position as well as hole size. In addition, a new degree of speed and convenience has been attained in our exclusive Direct Dimension measuring system.

Other major advancements in this machine contribute to a long life of consistent precision performance. Our new quill bearing design locates ball races

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Other features include—16 spindle speeds and 8 feeds, both *preselected* from push-button station. Rapid Traverse to head with electric clamping. Rapid traverse to quill (extra). Electronically-controlled milling feeds from $\frac{1}{8}''$ to 15" per minute. Table sizes—22" x 44", 22" x 54".

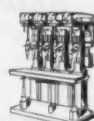
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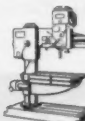
Radial Drills



Jig Borers



Sensitive and Upright Drills



Sensitive Radial Drills



Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

For more information on products advertised, use inquiry Card, page 245

MACHINERY, August, 1955—311

DRILLS, Deep Hole

Besley-Welles Corp., 112 Dearborn Ave.,
Beloit, Wis.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland 14, Ohio.
Gairing Tool Co., 21225 Hoover Rd., Detroit
32, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRILLS, Portable Electric

Chicago Pneumatic Tool Co., 6 E. 44th St.,
New York, N. Y.
Millers Falls Co., Greenfield, Mass.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd.,
Cincinnati, Ohio.

DRILLS, Portable Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St.,
New York 9, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Onsrud Machine Works, Inc., 3940 Palmer St.,
Chicago, Ill.

DRILLS, Ratchet

Armstrong Bros. Tool Co., 5200 W. Armstrong
Ave., Chicago, Ill.
Besley-Welles Corp., 112 Dearborn Ave.,
Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland 14, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester,
Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRILLS, Spade

Gairing Tool Co., 21225 Hoover Rd., Detroit
32, Mich.

DRILLS, Subland

Mohawk Tools, Inc., 910 E. Main St., Mont-
pelier, Ohio.

DRILLS, Twist

The Atrax Co. (Carbide) 240 Day St., Newing-
ton 11, Conn.
Besley-Welles Corp., 112 Dearborn Ave.,
Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland 14, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester,
Mich.
Pratt & Whitney, West Hartford 1, Conn.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRILLS, Wire

The Atrax Co. (Carbide) 240 Day St., Newing-
ton 11, Conn.
Besley-Welles Corp., 112 Dearborn Ave.,
Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester,
Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DUPLICATORS

Axelson Mfg. Co., 6160 S. Boyle Ave., Los
Angeles 58, Cal.
Gorton, George, Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Lehigh Foundries, Inc., 1500 Lehigh Dr.,
Easton, Pa.
Pratt & Whitney, West Hartford 1 Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St.,
Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois
& Alaska Aves., Detroit, Mich.

DUST COLLECTORS

Pangborn Corp., Hagerstown, Md.

DUST CONTROL SYSTEMS

Pangborn Corp., Hagerstown, Md.

ELECTRICAL EQUIPMENT

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

EMERY WHEEL DRESSERS

See Dressers, Grinding Wheel

EMERY WHEELS

See Grinding Wheels

END MILLS

The Atrax Co. (Carbide) 240 Day St., Newing-
ton 11, Conn.

ENGRAVING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St.,
Racine, Wis.

EXTRACTORS, Screw

Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

(Continued on page 314)



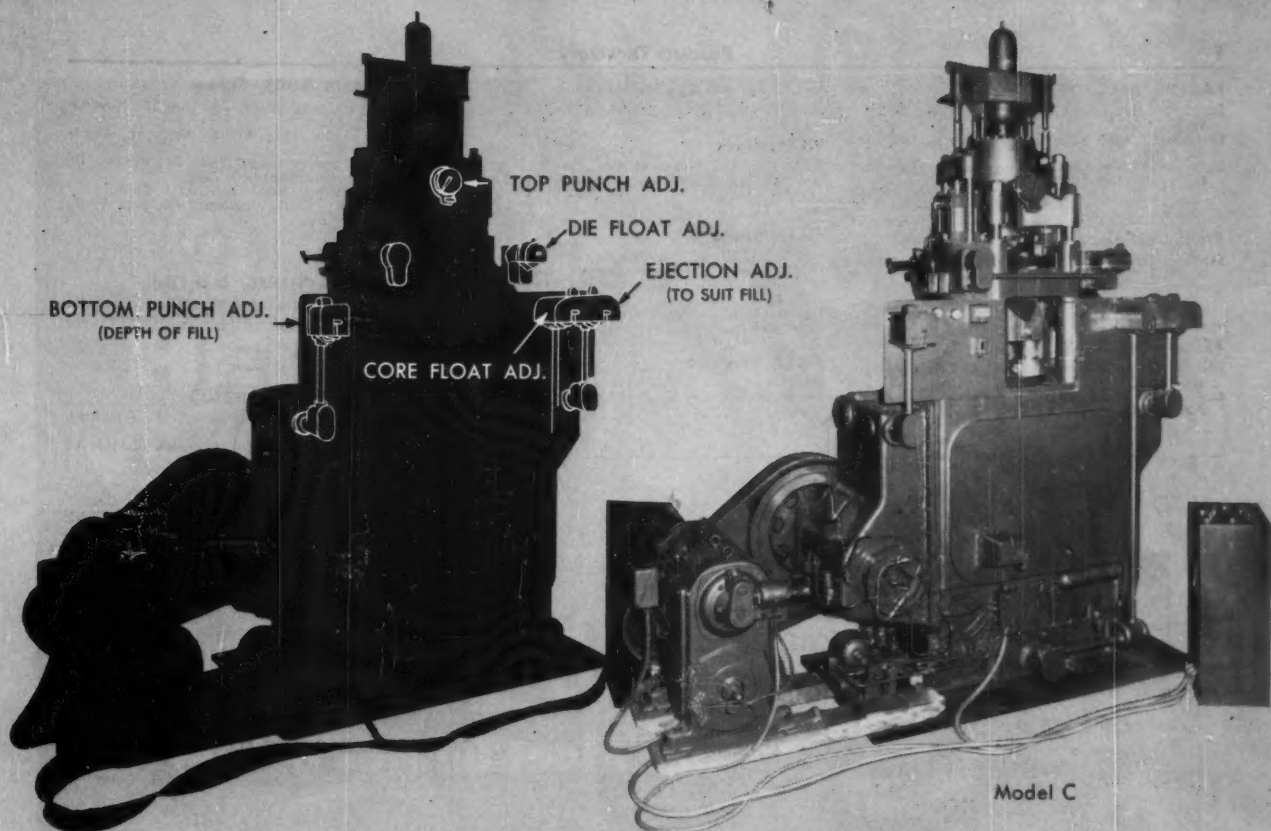
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 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
 National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

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Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
 General Electric Co., Schenectady 5, N. Y.

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Federal Machine & Welder Co., Overland Ave., Warren, Ohio
 U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

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American Felt Co., Glenville, Conn.

FILES, Hack

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
 Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Hand

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
 Heller Bros. Co., Newcomerstown, Ohio.
 Nicholson File Co., 23 Acorn St., Providence, R. I.
 Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Machine

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
 Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILES AND BURS, Rotary

The Atrax Co. (Carbide) 240 Day St., Newington 11, Conn.
 Mohawk Tools, Inc., 910 E. Main St., Montpelier, Ohio.
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
 Jarvis Corp., Middletown, Conn.
 Pratt & Whitney, West Hartford 1, Conn.
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

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 Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

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 Industrial Filtration Co. (Delpark Corp.) 15 Industrial Ave., Lebanon, Ind.

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Lowe Bros. Co., Dayton, Ohio.
 Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.

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See Couplings, Flexible

FLEXIBLE SHAFT EQUIPMENT

Jarvis Corp., Middletown, Conn.
 Pratt & Whitney, West Hartford 1, Conn.

FORGINGS, Machines (Upsetting)

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
 Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
 National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
 Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

FORGINGS, Drop

Bethlehem Steel Co., Bethlehem, Pa.
 Mueller Brass Co., Port Huron 35, Mich.
 Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORGINGS, Hollow Bored

Bethlehem Steel Co., Bethlehem, Pa.
 National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel

Bethlehem Steel Co., Bethlehem, Pa.
 National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Upset

Bethlehem Steel Co., Bethlehem, Pa.
 Mueller Brass Co., Port Huron 35, Mich.
 Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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American Steel Foundries, Elmes Engrg. Div., Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.
 Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
 Bethlehem Steel Co., Bethlehem, Pa.
 Chambersburg Engrg. Co., Chambersburg, Pa.
 Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
 Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
 Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
 Consolidated Mch. Tool Corp., Rochester, N. Y.
 Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.

(Continued on page 316)



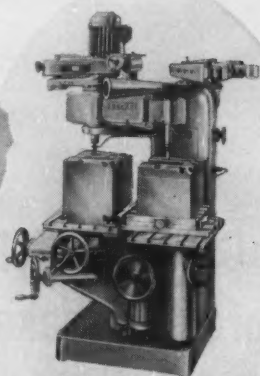
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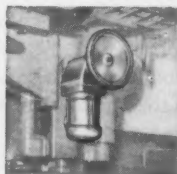
universal pantograph DIE SINKING MACHINE model KF12

Deckel die sinking machines are justly famous for their accuracy, production rate, and ease of operation. The KF12, latest and largest Deckel model, does heavy die-sinking jobs which formerly required much greater investment in equipment. Spindle speeds from 60 to 10,000 r.p.m. enable you to do rough and finish milling, as well as light engraving, on the same machine. The newly developed, "mirror image" milling attachment produces right and left hand dies and molds from the same pattern. Other important features are illustrated below.



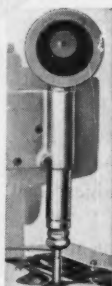
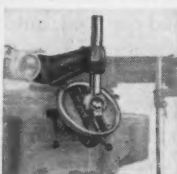
Deckel KF12 makes rapid, accurate enlargements or reductions from 1:1.5 to 1:4 as well as 1:1 duplication. The cutting tool covers an area up to 15 3/4" x 15 3/4" or up to 10" x 19 3/4".

Optical contacting device makes rough milling faster, more accurate. And, accurate rough milling reduces time for finishing.



Saddle elevating motor rapidly raises or lowers master and work-piece at the same time.

Circular forming attachment permits generating spherical shapes.



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Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy., Chicago, Ill.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

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Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

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Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
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National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

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Mahon, R. H. Co., Detroit 34, Mich.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

FURNACES, Heat-Treating

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

FURNITURE, Shop

Standard Pressed Steel Co., Jenkintown, Pa.

GAGE BLOCKS

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

GAGES, Air

Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Taft-Peirce Mfg. Co., Woonsocket, R. I.

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Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Comfor Co., 47 Farwell St., Waltham 54, Mass.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth

Ames, B. C., Co., (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S. Co., Athol, Mass.
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Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S. Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Electric

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Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

GAGES, Height

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DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
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Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Starrett, The L. S. Co., Athol, Mass.

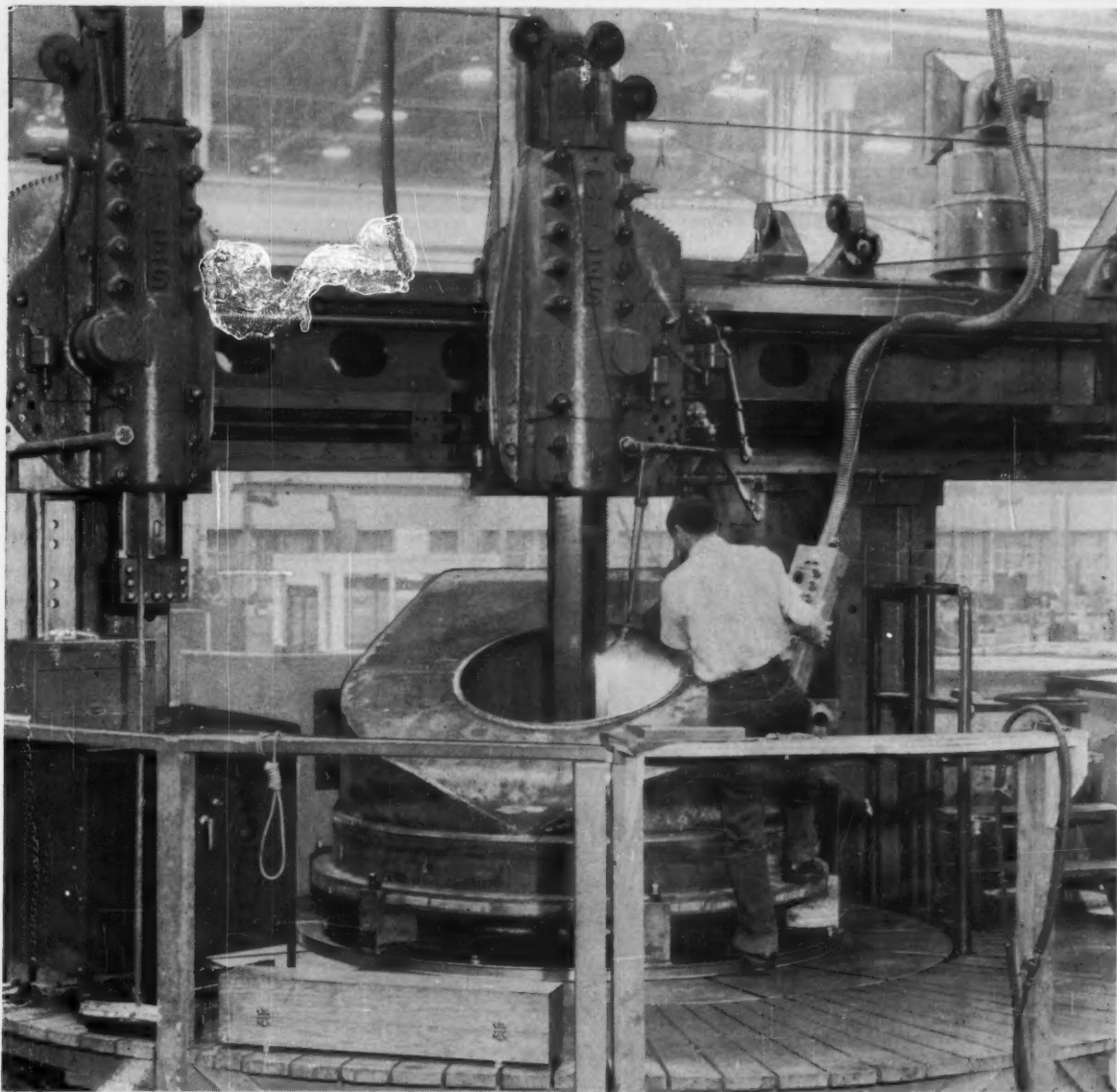
GAGES, Plug, Ring and Snap

Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Elgin National Watch Co., Aurora, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
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Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S. Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GAGES, Surface

Ames, B. C., Co., Waltham 54, Mass.
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Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
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(Continued on page 318)



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 Starrett, The L. S. Co., Athol, Mass.
 Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Thread

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 DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
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 Greenfield Tap & Die Corp., Greenfield, Mass.
 Pratt & Whitney, West Hartford 1, Conn.
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
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 Garlock Packing Co., Palmyra, N. Y.

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 Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
 Lipe-Railway Corp., 806 Emerson Ave., Syracuse, N. Y.
 Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
 Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

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 Gleason Works, 1000 University Ave., Rochester 3, N. Y.
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
 National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
 Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
 Starrett, The L. S. Co., Athol, Mass.
 Taft-Peirce Mfg. Co., Woonsocket, R. I.

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 Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

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 Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

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 Waltham Machine Works, Newton St., Waltham, Mass.

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 Lees-Bradner Co., Cleveland, Ohio
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
 New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
 Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
 Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

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 Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

GEAR CUTTING MACHINES, Worm and Worm Wheels

Barber-Colman Co., Rock and Montague, Rockford, Ill.
 Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
 Fellows Gear Shaper Co., 78 River St., Springfield, Vt. (Straight and Hourglass Types).
 Lees-Bradner Co., Cleveland, Ohio
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
 New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
 Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

(Continued on page 320)

Compare design then compare price
 ...you'll choose **GREAVES MILLS**
DESIGNED FOR ACCURACY



Overarm casting is rigid, boxlike structure; dovetail planed to perfect alignment with spindle.

Spindle and intermediate shafts jig bored for accurate alignment; mounted on over-size Timken bearings.

Heavy ribbed, box type, column casting assures rigidity.

Drive—5 HP 1750 RPM motor through multiple V-belt and dependable gear train; sliding gears in column are flame-hardened, mounted on spline shafts and are flooded with oil supplied by gear pumps with built in filter.

Husky arbor support has built-in oil reservoir, adjustable bronze bushing.

All sliding surfaces hand scraped to a bearing with mating member and with master gauges.

Line boring of table and saddle together after scraping assures proper alignment, provides free-running lead screw.

Knee is machine jig bored for accurate alignment. All units are indicator tested during assembly to meet established alignment for milling machines.

Wide range of speed-feed combinations for every class of work. Rapid traverse speeds operation.

- Rugged Greaves Mills are accurate and dependable, yet sell for thousands of dollars less than comparable machines.

- Make your own comparison. Send for free copy of Greaves Comparison Chart.

**GREAVES MACHINE TOOL CO.**

2500 Eastern Avenue, Cincinnati 2, Ohio

Please send me:

☐ The Comparison Chart. ☐ Tool Lease and Deferred Payment Plans.

Name _____ Title _____

Firm _____

Address _____

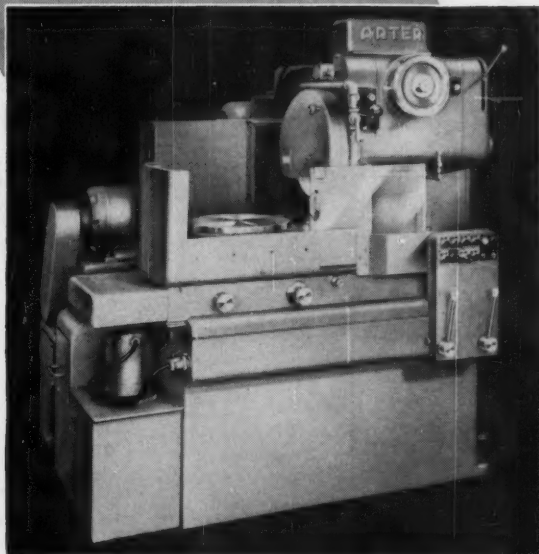
City _____ Zone _____ State _____

ARTER**FAMILY OF GRINDERS**

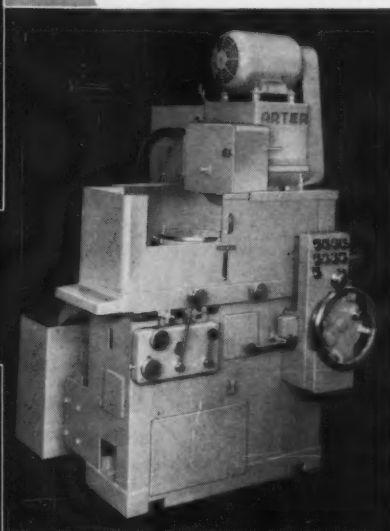
at the

MACHINE TOOL SHOW**Sept. 6-17 • Booth 1308**

A GENERATION of experience stands behind the ARTER family of grinding machines. Progressively these machines have attained advanced techniques, simplification of grinding processes, closer tolerances. Today ARTER is proud of the family including the newest members, Models E and F Rotary Surface Grinders, making their bows at the Tool Show.

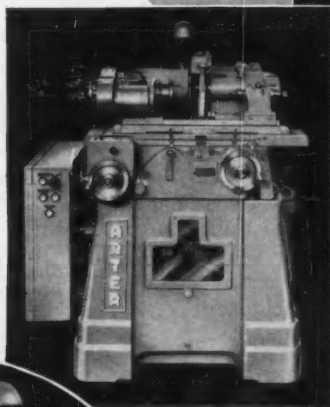


MODEL E—12" AND 16"
ROTARY SURFACE GRINDER

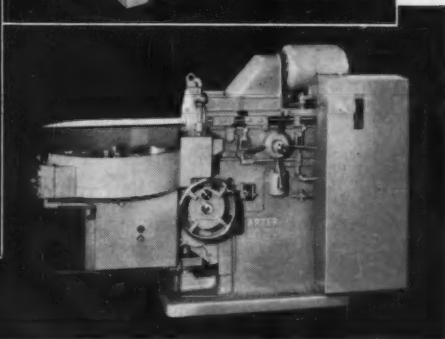


MODEL F 12"
ROTARY SURFACE
GRINDER

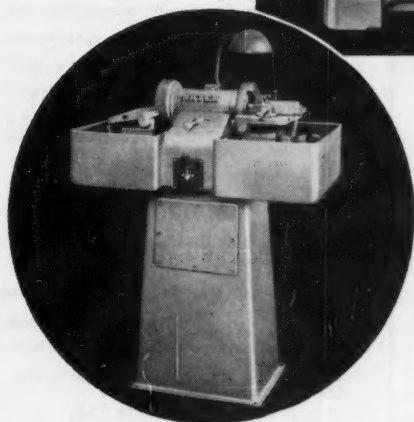
MODEL 103—
CYLINDRICAL AND
INTERNAL GRINDER



MODEL D—SPECIAL
SEMI-AUTOMATIC
ROTARY SURFACE
GRINDER
ARRANGED WITH
WORK-LOADING
AND PUSH BUTTON
GRINDER CYCLE



MODEL 200
CARBIDE TOOL GRINDER



ARTER GRINDING MACHINE CO.
WORCESTER • MASSACHUSETTS

Agents in industrial centers of United States and Canada

GEAR FINISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
 Gleason Works, 1000 University Ave., Rochester 3, N. Y.
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
 National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR GRINDING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17.
 Gear Grinding Machine Co., 3901 Christopher St., Detroit 11, Mich.
 Gleason Works, 1000 University Ave., Rochester 3, N. Y.
 Lees-Bradner Co., Cleveland, Ohio

National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
 Pratt & Whitney, West Hartford 1, Conn.
 Van Norman Co., Springfield, Mass.

GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
 National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR MOTORS

See Speed Reducers.

GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
 National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR TESTING MACHINERY

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
 Brown & Sharpe Mfg. Co., Providence, R. I.
 Eastman Kodak Co., Rochester, N. Y.
 Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
 Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
 Gleason Works, 1000 University Ave., Rochester 3, N. Y.
 Lees-Bradner Co., Cleveland, Ohio
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
 National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
 Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEARS, Cut

Automotive Gear Works, Inc., Richmond, Ind.
 Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
 Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
 Boston Gear Works, 3200 Main St., North Quincy, Mass.
 Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
 Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
 Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
 Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
 Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
 Fairfield Mfg. Co., 2309 S. Earl Ave., Lafayette, Ind.
 Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
 Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
 Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.
 Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
 Harsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
 Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.
 Lees-Bradner Co., Cleveland, Ohio
 Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
 National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
 New Jersey Gear Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
 Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
 Pittsburgh Gear Co., Neville Island, Pittsburgh 25, Pa.
 Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
 Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
 Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
 Westinghouse Electric Corp., E. Pittsburgh, Pa.
 Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic

Boston Gear Works, 3200 Main St., North Quincy, Mass.
 Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
 Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
 Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
 Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.

(Continued on page 324)



—or, if you prefer, let us tell you the whole story right now—the story of how you can produce more gears and better gears—more splines and better splines—in less time—at lower cost.

Gear-O-Mation* will be shown in operation at the Machine Tool Show. All units are now in production and have been production-tested.

★Trademark



7171 E. McNichols Rd. • DETROIT 12, MICHIGAN, U. S. A.
 IN CANADA: COLONIAL TOOL CO., LTD.



High Speed Production Grinding **DEMANDS** more than just a Coolant!

High speed production grinding has made just *coolants* obsolete! Today's water-mix grinding fluid must provide lubrication, heat dissipation qualities, anti-rust protection and balanced surface tension. If you're using "*just a coolant*," it's costing you extra money!

Stuart's CODOL is a carefully designed liquid grinding compound that is *far more than just a coolant*. CODOL has been scientifically compounded to

provide far more detergency than ordinary water-mix grinding fluids. Wheel loading is greatly reduced and allows more pieces to be ground per wheel dressing.

CODOL's carefully balanced surface tension insures the carrying away of chips and abrasive particles from the wheel, work and machine. Surface finish is improved, production is increased and good wheel life is obtained.

To be sure that you consider *all* of the important points, such as ease of mixing, resistance to rancidity, gumming and foaming, when selecting a water-mix grinding fluid, ask "the Man in the Barrel," your Stuart Representative, to call and help you. And write today for your copy of the Stuart Water-Mix Cutting and Grinding Fluid book.

D. A. STUART OIL COMPANY, LTD.
S. Troy St., Chicago 23, Ill.

More than a "Coolant" is Needed

Plants in: Chicago, Detroit, Cleveland, Hartford, and Toronto, Ontario.

Branch Warehouses and Representatives in principal metal working centers in the United States, Canada and Europe.



Stuart Oils

Time Tested Cutting Fluids and Lubricants

WALES

announces a

FREE

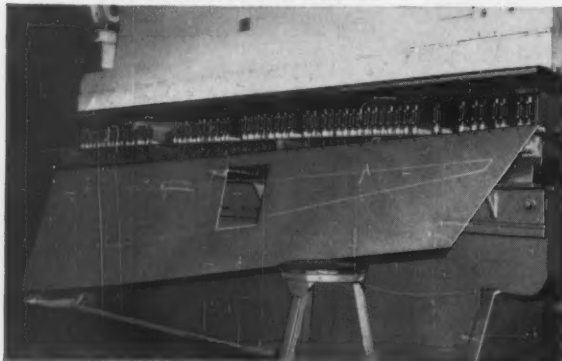
COST REDUCTION ANALYSIS

FOR SHEET METAL FABRICATORS

This free service includes a complete analysis of your sheet metal fabricating operations by Wales competent and experienced engineers. By analyzing your present or future parts production, Wales engineers provide you with an evaluation study of your present costs compared with Wales methods and tooling.

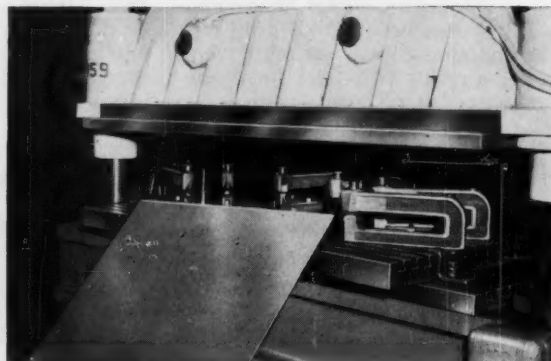
NO OBLIGATION, OF COURSE!

Typical of the many setups of the independent self-contained Wales Type "C" Hole Punching Units in a press brake at Canadair which produced in one year **SAVINGS OF APPROXIMATELY 46,000 HOURS.**



The astounding savings illustrated and described below, from one of many plants in the United States and Canada where the Wales Application Engineers have gone into operations, are typical of the huge savings made possible by Wales Production Method of hole punching and notching.

One of the many setups of Wales Type "BL" Hole Punching Units which are used and reused in unlimited hole patterns at Canadair producing in one year **SAVINGS OF APPROXIMATELY 12,000 HOURS.**



What **WALES** Metal Working Equipment has done for

Canadair

OF MONTREAL, LIMITED



In the "Wales Department", as this section of the Canadair plant is commonly called, where these time studies, savings and photographs were made is a very efficient and cost-conscious department which, due to continuous efforts, have improved on cost savings submitted in the original Wales analysis. Actual operations, after the purchase of the Wales tooling and equipment, showed the survey figures on the conservative side.

Production savings produced by Wales tooling and equipment made the initial purchase costs a relatively small item.

HOW TO PUT THE WALES APPLICATION ENGINEERS TO WORK FOR YOU

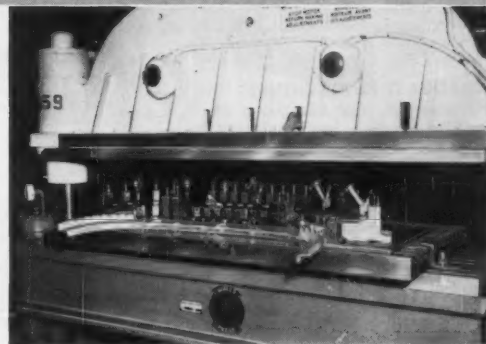
Wales Application Engineers stand ready to make a complete evaluation of your sheet metal operations. Just call or write TODAY for an appointment at your convenience.

WALES-STRIPPIT CORPORATION

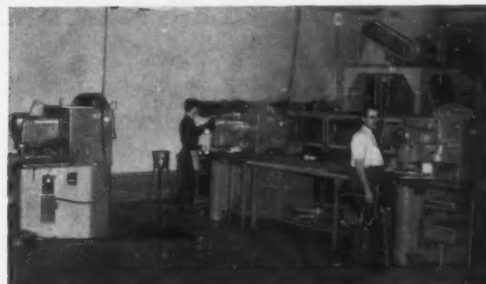
George F. Wales, Chairman
575 Payne Avenue, North Tonawanda, N. Y.
(Between Buffalo and Niagara Falls)

Specialists in Punching and Notching Equipment

Stacking bins and setup table for Wales Units at Canadair. Note setups are made outside the press and when placed in press are ready to operate with the first stroke of the ram.



A setup of Wales "H" Hole Punching Units in a Wales Twin Column Press for horizontal punching of flanges at Canadair which produced **SAVINGS OF APPROXIMATELY 4,000 HOURS.**



Three Wales Fabricators with "Quick Change" punches and dies which provide unusual time-saving and money-saving advantages at Canadair.

Three setups of Wales Units in a press brake punching three different parts at the same time reducing press time by one-third. Note nothing is attached to press ram. Punches and dies are automatically aligned by self-contained Wales Units.



Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio
 Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
 Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
 Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
 Pittsburgh Gear Co., Neville Island, Pittsburgh 25, Pa.
 Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
 Westinghouse Electric Corp., E. Pittsburgh, Pa.
 Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schenectady 5, N. Y.
 Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.
 Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.
 Westinghouse Electric Corp., E. Pittsburgh, Pa.

GRADUATING MACHINES

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
 Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
 Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio

GREASE

Cities Service Oil Co., 70 Pine St., New York, N. Y.
 Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
 Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
 Shell Oil Co., 50 W. 50th St., New York, N. Y.
 Sinclair Refining Co., 600 5th Ave., New York, N. Y.
 Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
 Sun Oil Co., 1608 Walnut St., Philadelphia.
 Texas Co., 135 E. 42nd St., New York, N. Y.

GRINDERS, Carbide Tool

See Grinding Mches., Carbide Tool

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y.
 Pratt & Whitney, West Hartford 1, Conn.
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
 Ingersoll-Rand Co., Phillipsburg, N. J.
 Madison-Kipp Corp., Madison, Wis.
 Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

GRINDERS, Portable Electric and Toolpost

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
 Millers Falls Co., Greenfield, Mass.
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDING FIXTURES

Geometric Tool Co., (Die Chaser), Westville Station, New Haven 15, Conn.
 Taft-Peirce Mfg. Co., Woonsocket, R. I.

GRINDING MACHINES, Abrasive Belt

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
 Mattison Mch. Works, Rockford, Ill.
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
 Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
 Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
 Millers Falls Co., Greenfield, Mass.
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
 Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
 U. S. Burke Machine Tool Div., Brotherton Rd. 17, Cincinnati 27, Ohio.

GRINDING MACHINES, Broach

Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
 Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.
 Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Carbide Tool

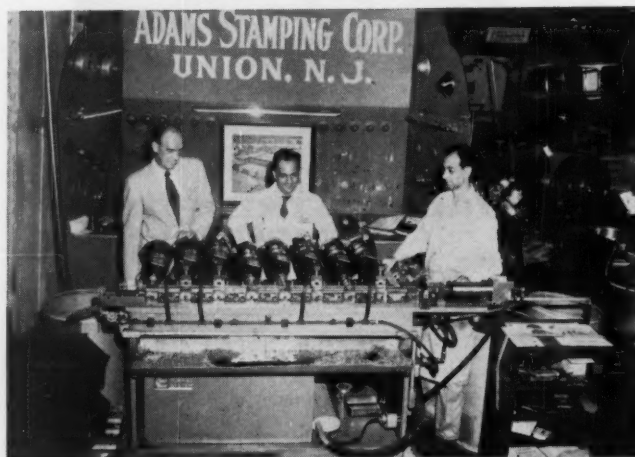
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
 Carboly Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

(Continued on page 328)

Simplifying An 8-Operation Drilling and Tapping Job

Faced with a number of difficulties in connection with a job of drilling and tapping a copper electrical part, the Adams Stamping Corporation, Union, N. J., solved its problems by the use of Govro-Nelson Automatic Drilling and Tapping Units.

With a special machine which the company designed and built, incorporating 3 Drilling Units equipped with "O" drills, 3 Tapping Units using $\frac{1}{8}$ -27 taps, and 2 Tapping Units using 10-32 taps, 8 operations were performed on the electrical part at the rate of 1020 pieces per hour. The new method not only tripled production but also increased tap life to 20,000 holes.



If you would like to speed up your production rate and reduce production costs on drilling and tapping operations, send samples and part prints for our engineering staff's recommendation. No obligation.

WRITE FOR
Literature

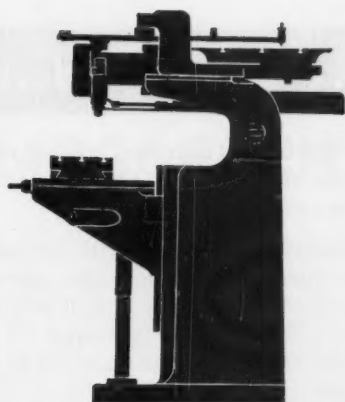
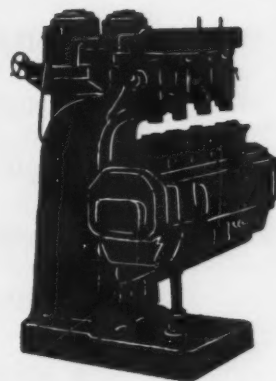
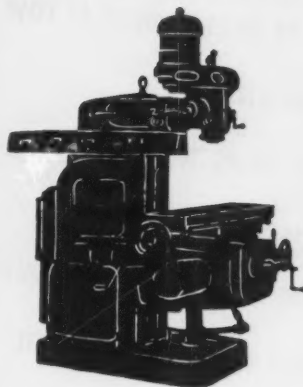
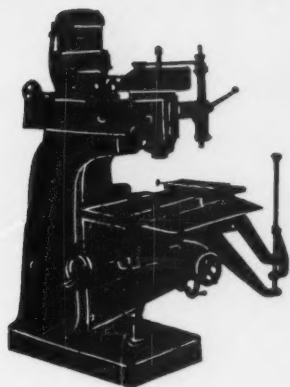
GOVRO-NELSON CO.

Machinists of Precision Parts for 32 Years

1933 Antoinette
Detroit 8, Mich.



Shadows of Good Things to Come . . .



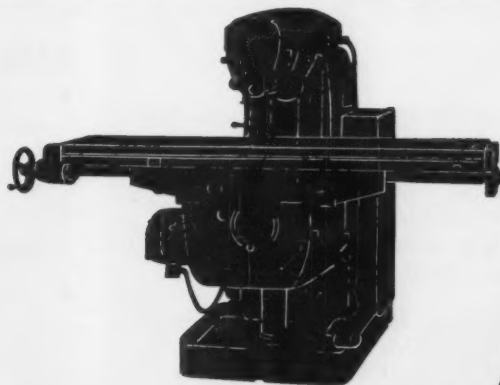
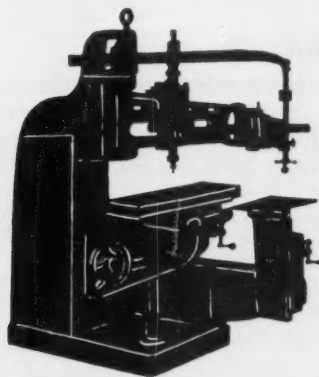
The "good things" are production speed-ups and cost cuts . . . yours with new Gorton machines. Come to Gorton's booth and see 17 machines operating under production load — many brand new and never before exhibited; some completely re-designed; others with typical Gorton improvements.

Included . . .

Gorton No. 2 Horizontal with Receptor Ram and Super-Speed Universal head and ram assembly. Don't miss the *Economy Model* — No. 3 Horizontal with 76" table and 48" table travel.

VISIT **GORTON'S** Booth No. 1019 (Ground floor, south end of South Hall)

The latest in Tracer Control — manual, semi-automatic and completely automatic within the cutting cycle. Spindle speeds up to 48,000 rpm; hp as required.



Yours on request —
Catalog 1655-1308.



GEORGE GORTON MACHINE CO.

1308 Racine St., Racine, Wis., U.S.A.

SINCE 1893

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

For more information on products advertised, use Inquiry Card, page 245

MACHINERY, August, 1955—325

- ASSURES ACCURATE MEASUREMENT AT LOW COST
- REDUCES GAGE INVENTORY
- SOLVES DIFFICULT INSPECTION PROBLEMS
- LOWERS PERISHABLE TOOL COSTS
- HOLDS DOWNTIME OF PRODUCTION EQUIPMENT TO A MINIMUM
- ASSURES QUALITY IN QUALITY CONTROL

all these advantages and more are combined in

EXTREMELY ACCURATE PERFORMANCE

- Wholly integrated design, built to precise machine tool standards for extreme rigidity.
- Precision mirrors and lenses are specifically designed and manufactured by Jones & Lamson to meet the exacting qualifications of optical inspection.
- Work tables guided on either ball bearings or scraped ways.
- Angle measurements read direct to the exact minute.
- Projection illumination approaching the ideal point source of light affords sharp, high contrast shadow images on the viewing screen.

VERSATILITY

- Long focal length lenses provide generous clearance in the staging area at all magnifications.
- Multiple lens mount allows rapid selection of any of six preset magnifications. You just turn a knob. Single lens mounts accept lenses of all magnifications without adjustment.
- ***5" or 8" capacity in one machine. Simply lower or raise work table assembly.

... AND MORE VERSATILITY

- Reflection attachment provides an acute angle light source at each side of the projection lens for oblique illumination. The light can be converged from a 1½" to a ¼" area. This is extremely beneficial for reflections at high magnifications.

- Normal light reflection attachment allows reflection inspection of deep holes, shoulders and polished surfaces.
- Vertical projection can be obtained with vertical illuminating attachment, providing a light source at right angles to the projection lens. Vertical projection tables allow parts to be staged on a clear glass surface with coordinate travel of 3" x 4". Measurements to .0001".
- Tracing attachments, for inspecting surfaces that cannot be projected or reflected, consist of a coordinate slide that gives corresponding paths to two carbide tipped styli.
- Photographic records may be taken directly on the viewing screen.

EASE OF OPERATION

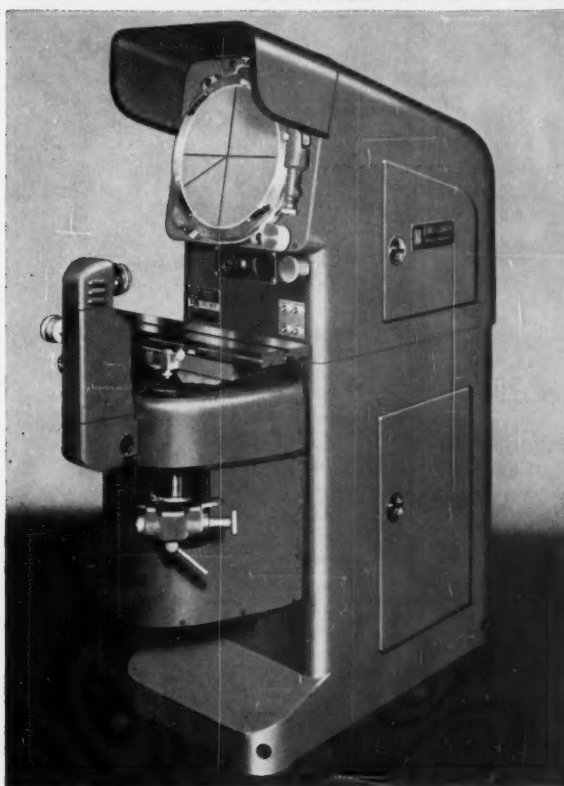
- ***Electronic variable speed vertical measuring control allows work piece to be raised or lowered, slowly or rapidly. Quick, precise measurements to .0001" are made in this same motion with fingertip control.
- Erect image at all magnifications.
- 10° screen angle allows comfortable viewing at a natural position for one or several people. This screen angle makes the use of overlay charts extremely easy.
- Screen location in relation to work area permits coordination of hand and eye for most efficient operation.
- **Cabinet base for table models, designed for convenient height of seated operator, contains storage space for charts and fixtures. A dolly for this base makes this unit a portable comparator.

JONES & LAMSON

NEW

14" SCREEN OPTICAL COMPARATORS

See them at The Machine Tool Show — Booth #1111



***MODEL FC-14 — Functionally designed floor model



**MODEL TC-14 — All purpose table model

JONES & LAMSON

JONES & LAMSON MACHINE CO., 512 Clinton St., Dept. 101, Springfield, Vt., U.S.A.



*World's Largest Manufacturer
of Optical Comparators since 1919*

OPTICAL COMPARATOR DIV.

For more information on products advertised, use Inquiry Card, page 245

MACHINERY, August, 1955—327

Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernon Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Waynesboro, Pa.
Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Chucking

Baird Machines Co., 1700 Stratford Ave., Stratford, Conn.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Bullard Co., Brewster St., Bridgeport, Conn.
Landis Tool Co., Waynesboro, Pa.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio

GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Landis Tool Co., Inc., Waynesboro, Pa.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Norton Co., 1 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Van Norman Co., 2640 Main St., Springfield 7, Mass.

GRINDING MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

Besley-Welless Corp., 112 Dearborn Ave., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDING MACHINES, Drill

Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, Face

Besley-Welless Corp., 112 Dearborn Ave., Beloit, Wis.
Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Mattison Machine Works, Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment

GRINDING MACHINES, Gap

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth

See Gear Grinding Machines

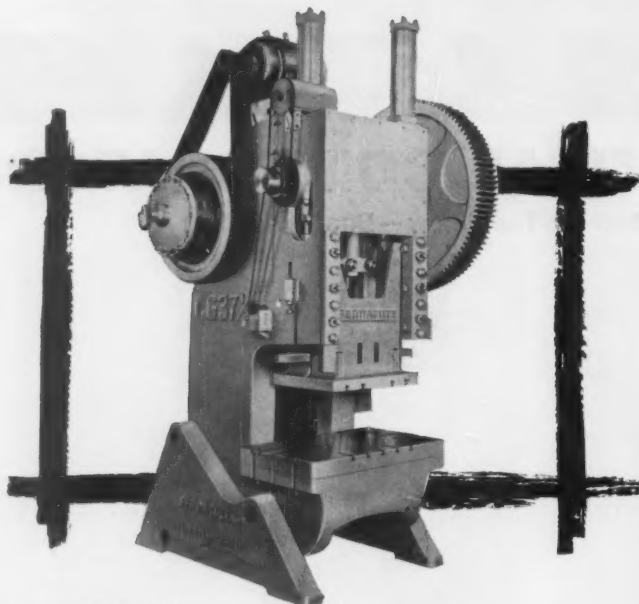
GRINDING MACHINES For Sharpening Cutters, Reamers, Hobbs, Etc.

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, For Sharpening Turning and Planing Tools

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

(Continued on page 332)



Send for new Catalog 32
Complete specifications on 110-ton,
150-ton, 200-ton Open Back Inclined
presses.

FERRACUTE

FERRACUTE

O.B.I. Presses
110 Ton
150 Ton
200 Ton

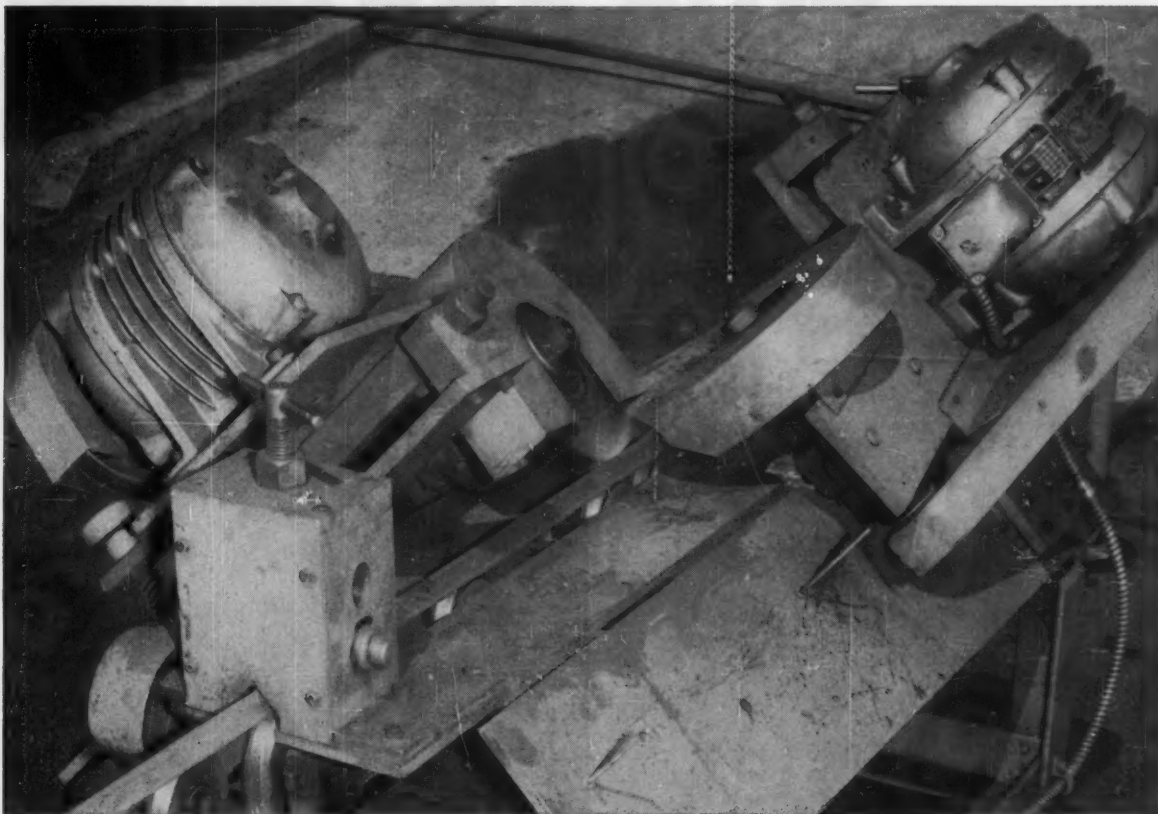
All have Air Friction Clutch
with Interconnected Brake as
standard equipment.

Look for this new Ferracut
press at the Machine Tool
Show, Chicago,
Sept. 6-17.

**FERRACUTE MACHINE COMPANY**

Since 1863 Builders of Power Presses
Press Brakes and Special Machinery
Bridgeport, New Jersey, U. S. A.

**NOW BUILT TO
JIC STANDARDS
with
BOX-TYPE RAM**



***FAST PASS* STRIPS SCALE** to save money on material!

A cost-reducing idea an OBA can duplicate in your plant

This manufacturer takes advantage of a price differential by buying a grade of angle iron that still has mill scale on it.

The Problem: How to remove this hard scale and still save money over purchasing a more costly grade of steel that has been pickled.

Here's what they do: The angle iron bars are fed through a simple brushing machine against two Osborn Master® Wheel power brushes. In one pass, these Osborn Brushes effectively remove the hard, flint-like scale . . . at a rate of 150 feet a minute.

The strips come clean, ready for production.

You benefit many ways by having an **Osborn Brushing Analysis** made of your cleaning and finishing operations. You can improve the quality of your product, automate your methods and cut manufacturing costs. Write us about an **OBA**. The Osborn Manufacturing Company, Dept. D-32, 5401 Hamilton Ave., Cleveland 14, Ohio.



Osborn Brushes



BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

For more information on products advertised, use Inquiry Card, page 245

MACHINERY, August, 1955—329

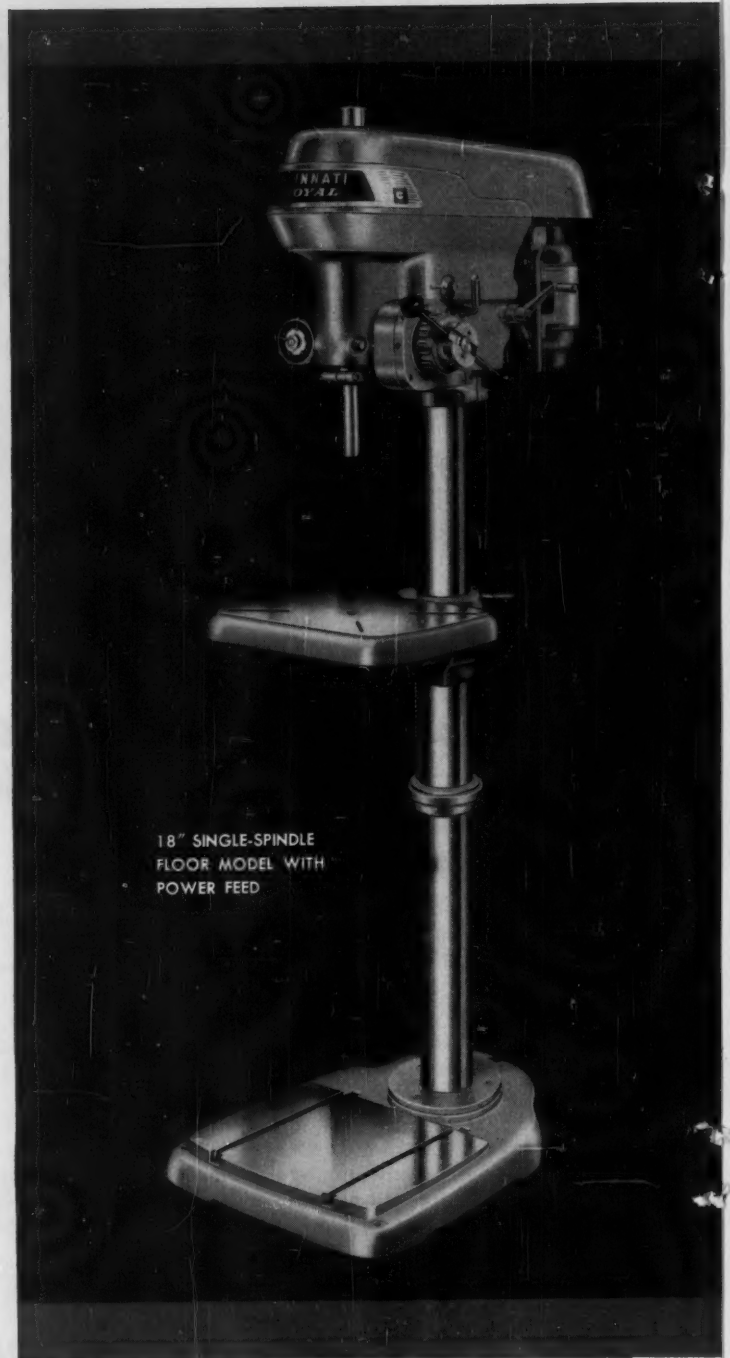
NEWS OF TWO GREAT NEW

**16" and 18" sizes ...
bench, floor and multi-
spindle—power feed
on larger sizes**

Look at these handsome new drills and you'd guess they cost twice their modest price. Run them all day on production jobs and you'd say they're worth it. These are real machine tools, yet they're priced to a home workshop budget.

What does this mean to a machine shop, a maintenance shop or a school? It means that no job need go begging for modern equipment. No operator need sacrifice the safety and convenience of a full belt guard and built-in electrical controls. No production line need be slowed by old-fashioned drills. Not when clean, modern machine tools can be bought for prices like these.

New catalogs and specification sheets are ready on the 16" Royals. Write for them and the name of your nearest Cincinnati dealer. Cincinnati Lathe and Tool Co., 3270 Disney, Cincinnati 9, Ohio.



18" SINGLE-SPINDLE
FLOOR MODEL WITH
POWER FEED



CINCINNATI LATHE AND TOOL CO.

DRILLS FROM CINCINNATI



18" 3-SPINDLE
BENCH MODEL WITH
POWER FEED



16" SINGLE-SPINDLE
BENCH MODEL

Shop for a drill with all these built-in features supplied as standard equipment, then compare prices with the NEW ROYALS

1. Power feed at slight extra cost on 18" models.
2. Shipped complete with built-in electrical controls. Merely mount motor, connect leads and start drilling.
3. Direct-drive through simple V-belt transmits power to 6-splined spindle.
4. Easy speed change—raise guard, tilt motor, shift belt.
5. Full-floating spindle mounted in four precision, lifetime lubricated bearings.
6. Five spindle speeds on 16"; six on 18" drills.
7. Quick-set depth dial and positive stop.
8. Heavy column of ground tubular steel; castings of close-grained iron.
9. Machined working surfaces.
10. Built to definite standards of accuracy and tested before shipment.

THE
MACHINE TOOL
SHOW
CHICAGO, ILL.
SEPT. 8-17, 1938
INTERNATIONAL AMPHITHEATRE

BOOTH NO. 309



Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
 South Bend Lathe Works Inc., 425 E. Madison St., South Bend, Ind.
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
 Walker, O. S., Co., Inc., Worcester, Mass.
 Waltham Machine Works, Newton St., Waltham, Mass.

GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
 Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
 Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
 Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass.
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
 Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.

GRINDING MACHINES, Jig

Moore Special Tool Co. Inc., 724 Union Ave., Bridgeport, Conn.
 Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear Blade

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
 Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
 Mattison Machine Works, Rockford, Ill.
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

GRINDING MACHINES, Piston Ring

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
 Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
 Mattison Machine Works, Rockford, Ill.
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Profile

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
 Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

GRINDING MACHINES, Ring Wheel Ball Race, Etc.

Landis Tool Co., Waynesboro, Pa.
 Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Radial

Consolidated Mch. Tool Corp., Rochester, N. Y.
 Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

GRINDING MACHINES, Radius, Link

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
 Mattison Machine Works, Rockford, Ill.
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Roll

Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
 Farrel-Birmingham Co., 25 Main St., Ansonia, Conn.
 Landis Tool Co., Waynesboro, Pa.
 Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Spline Shaft

Van Norman Co., Springfield, Mass.

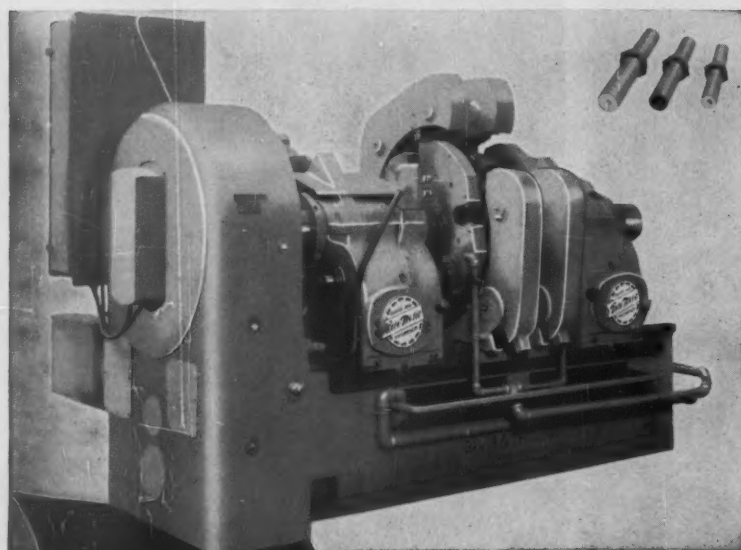
GRINDING MACHINES, Surface

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
 Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. (Rotary)
 Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
 Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
 Blanchard Machine Co., 64 State St., Cambridge, Mass.
 Brown & Sharpe Mfg. Co., Providence, R. I.
 Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
 Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
 Gallmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.
 Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
 Lemco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
 Mattison Machine Works, Rockford, Ill.
 Norton Co., 1 New Bond St., Worcester 6, Mass.
 Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
 Pratt & Whitney, West Hartford 1, Conn.
 Reid Bros. Co., Inc., Beverly, Mass.
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
 Taft-Peirce Mfg. Co., Woonsocket, R. I.
 Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
 Walker, O. S., Co., Inc., Worcester, Mass.

GRINDING MACHINES, Top

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
 Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

(Continued on page 335)



**Milling
and Centering
Simultaneously
and in
Continuous
Production**

**FREE
DATA**

Here's an excellent example of how two entirely different operations can be combined on one machine. This Davis and Thompson continuous type Roto-Matic both mills and centers on both ends in one operation. Rough and finish milling cuts on the ends of the shaft and centering of both ends is completed with only one rotation of the fixture drum. The centering heads travel with the work station until centering operation is complete then drop back to next work station and repeat. Automatic equalizing clamping is provided to the fixture. Spindles have micrometric adjustment and spindle carriers are adjustable on the ways to accommodate shafts of various lengths.

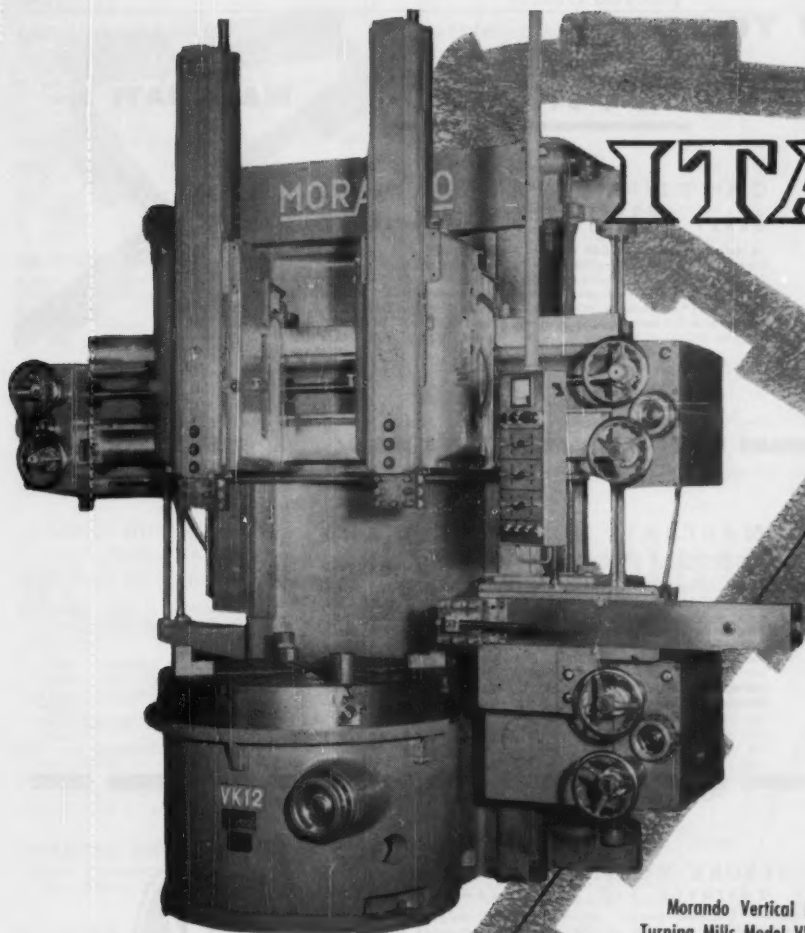
on this and other Davis and Thompson machines is available in our bulletin No. 1000.



Davis and Thompson Co.

4460 N. 124th St.

MILWAUKEE 16, WISCONSIN



ITALY...

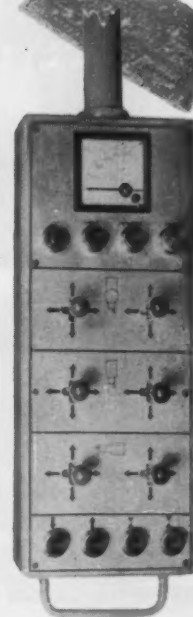
Morando Vertical Boring and
Turning Mills Model VK Available
in sizes 36, 47, 57, 67, and 79 inches

ITALY TO EXHIBIT OUTSTANDING MACHINE TOOLS at CHICAGO COLISEUM

Under the sponsorship of the Italian Government,
the Italian Machine Tool Industry will exhibit its
outstanding lines of metal working tools at the
"Coliseum Machinery Show" in Chicago, September 6
to 17, 1955.

The exhibit, coordinated through the Agency of the Maserati
Corporation in America, will have an Information desk, staffed
by the Italian Trade Commissioner in Chicago, to offer faci-
litations to visitors.

Booth 636, measuring over 1200 square feet, has been reserved
and members of the American and Canadian machine tool industry
are cordially invited to visit the exhibit. On display will be horizontal
and vertical milling machines, hydraulic surface grinders, radial drills,
hydraulic tracing attachments for lathes, milling machines and shapers,
engine lathes and vertical boring machines, tool room lathes, and iron
workers. Some of these are shown on the next page.



First shown in Milan in 1954,
this is the famous Morando
pendant control unit for all
feeds and rapid movements
of all the heads with direc-
tional finger-tip controls, sim-
plified to such an extent that
even semi-skilled operators
can run the machine.

MASERATI CORP. OF AMERICA



WESTBURY, NEW YORK

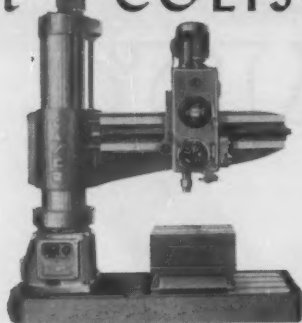
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For more information on products advertised, use Inquiry Card, page 245

MACHINERY, August, 1955—333

SEE THESE NEW TOOLS...

at COLISEUM Booth 636



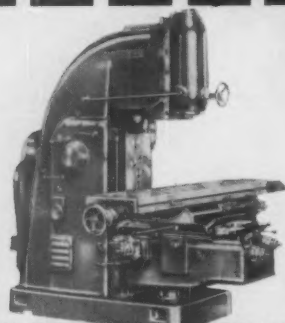
CASER RADIAL DRILLS

MODEL FR-10/1250

Other Models FR-7, FR-9, FR-11

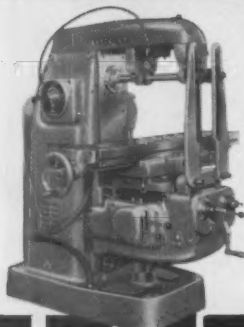
16 spindle speeds 35-2040 rpm — 8 feeds. 0030-.024 per rev., travel $1\frac{1}{4}$ " — diameter $2\frac{3}{4}$ " ($3\frac{3}{4}$ " — spindle distance to base $4\frac{1}{2}$ " (max.) — $11\frac{1}{2}$ " (min.) — drilling radius $4\frac{1}{2}$ " (max.) — $1\frac{1}{2}$ " (min.) — arm length $4\frac{1}{2}$ " — head travels $1\frac{1}{2}$ " — arm length $4\frac{1}{2}$ " — capacity in steel 60 — capacity in cast iron 22 — taper morse 5 — motor 6 hp — base measurements $8\frac{1}{2}$ " x $7\frac{1}{2}$ " x $3\frac{1}{2}$ " — total height of machine 9' — net weight, approx. 7,300 lbs

MASERATI



MASERATI HORIZONTAL AND VERTICAL MILLING MACHINES

20 spindle speeds — 18-1380 rpm — 24 power feeds — longitudinal $\frac{3}{8}$ " — 61 in/min. (9-1566 mm.) cross $\frac{3}{8}$ " — 61 in/min. (9-1566 mm.) — vertical $\frac{1}{16}$ " — 52 in/min. (8-1300 mm.) — 24 vertical feeds of head $\frac{7}{16}$ " — 38" (5-980 mm.) — Speed and feed changes controlled by single lever over hydraulic and cam units — direct readings on two revolving dials — Dual controls at front and rear for all power and hand traverses of all slides — Power rapid traverses in all directions — Single lever control of clutch and hydraulic brake—Automatic lubrication—Built-in electrical controls.



WESTBURY HORIZONTAL MILLS

The Westbury 1-U, 2-U, and 3-U;

Heat-treated, hardened spindle; all moving parts designed to withstand overloads in excess of 100% — Spindle mounted on adjustable tapered roller bearings — 12 speeds, 28 to 1100 rpm or 35 to 1600 rpm — dial and hand control for selecting and reversing — Splash lubricated spindle gear box, extra gear pump for added safety — Power feed and rapid traverse in all directions — Climb milling — Special safety devices prevent operating errors — All ways handcraped — Single lever engages rapid traverse to all movements.

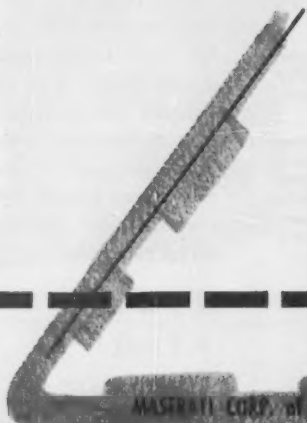
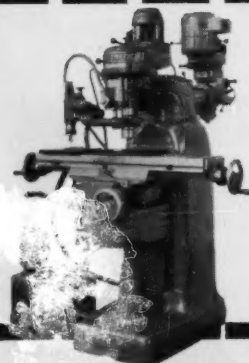


WESTBURY VERTICAL MILLS

The Westbury 1-S and 1-R;

Hardened and ground high-speed ball bearing spindle — 5" quill travel, micrometer depth stop — Three feeds, .0016; .003; .005 — Rapid spindle change over, 8 speeds (80-2713) — Dovetailed over-arm (1-S) — Round overarm (1-R) — Precision angle setting control — Rigidly mounted table — $42\frac{3}{4}$ " x $9\frac{1}{4}$ " — 30" longitudinal range, 10" transverse, 16" vertical — Positive locks — Motor, 1.5 hp — Weight, 2200 lbs.

The Dupromatic Duplicating Attachment Model FR for milling machines: hydraulic precision reproduction of molds, patterns, and templates in any material.



MASERATI CORP. BY APPOINTMENT

WESTBURY, NEW YORK

**DISTRIBUTORS IN NEW YORK • BUFFALO • DETROIT • CHICAGO • BOSTON
PITTSBURGH • INDIANAPOLIS • LOS ANGELES**

G-H

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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Machine Co. (Centerless), Waynesboro, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

GRINDING MACHINES, Universal

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING WHEELS

Blanchard Machine Co., 64 State St., Cambridge, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Gardner Machine Co. (Surface Grinder), 414 E. Gardner St., Beloit, Wis.
Macklin Co., 2925 Wildwood Ave., Jackson, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Precision Diamond Tool Co., 102 South Grove Ave., Elgin, Ill.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hill, N. J.

GROOVING TOOLS, Internal

Waldes Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

HAMMERS, Drop

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.

HAMMERS, Forging Air

Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Lobdell United Div., United Engrg. & Foundry Co., Wilmington 99, Del.

HAMMERS, Pneumatic

Chambersburg Engrg. Co., Chambersburg, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

HAMMERS, Portable Electric

Millers Falls Co., Greenfield, Mass.

HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa.
Lobdell United Div., United Engrg. & Foundry Co., Wilmington 99, Del.

HAMMERS, Shaft

Standard Pressed Steel Co., Jenkintown, Pa.

HAMMERS, Soft

Chambersburg Engrg. Co., Chambersburg, Pa.
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

HARDENING EQUIPMENT

Gleason Works, 1000 University Ave., Rochester, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

Product Directory

HARDENING MACHINES, Flame

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Gleason Works, 1000 University Ave., Rochester, N. Y.

HARDNESS TESTING INSTRUMENTS

Olsen, Tinius, Testing Mch. Co., Willow Grove, Pa.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Shore Instrument & Mfg. Co., Van Wyck Ave., and Carl St., Jamaica, N. Y.
Wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N. Y.

HEADING MACHINES

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

HOBGING MACHINES

See Gear Cutting Machines, Spur and Helical Gears (Hobbing), and Gear Cutting Machines, Worm and Worm Wheels.

HOBS

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lees-Bradner Co., Cleveland, Ohio
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Twist Drill & Tool Co., Rochester, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Union Twist Drill Co., Athol, Mass.

HOIST HOOKS

Bethlehem Steel Co., Bethlehem, Pa.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

(Continued on page 336)

SAVE VALUABLE SHOW TIME!

Chicago, Illinois
Sept. 6th-17th

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More Time to See "All Three"

1. Machine Tool Show (International Amphitheatre)
2. Coliseum Machinery Show (Chicago Coliseum)
3. Production Engineering Show (Navy Pier)

(COLISEUM MACHINERY SHOW)
(Free Admission Service)
SHELDON MACHINE CO., INC.
4246 North Knox Ave. Chicago 41, Ill.

Gentlemen: Please send my free admission ticket to the Coliseum Machinery Show.

Name _____
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I AM ALSO INTERESTED IN NEW CATALOGS DESCRIBING:
☐ Sheldon 10" ☐ 11" ☐ 13" ☐ 15" ☐ 17" ☐ 19" ☐ 21" ☐ 23" ☐ 25" ☐ 27" ☐ 29" ☐ 31" ☐ 33" ☐ 35" ☐ 37" ☐ 39" ☐ 41" ☐ 43" ☐ 45" ☐ 47" ☐ 49" ☐ 51" ☐ 53" ☐ 55" ☐ 57" ☐ 59" ☐ 61" ☐ 63" ☐ 65" ☐ 67" ☐ 69" ☐ 71" ☐ 73" ☐ 75" ☐ 77" ☐ 79" ☐ 81" ☐ 83" ☐ 85" ☐ 87" ☐ 89" ☐ 91" ☐ 93" ☐ 95" ☐ 97" ☐ 99" ☐ 101" ☐ 103" ☐ 105" ☐ 107" ☐ 109" ☐ 111" ☐ 113" ☐ 115" ☐ 117" ☐ 119" ☐ 121" ☐ 123" ☐ 125" ☐ 127" ☐ 129" ☐ 131" ☐ 133" ☐ 135" ☐ 137" ☐ 139" ☐ 141" ☐ 143" ☐ 145" ☐ 147" ☐ 149" ☐ 151" ☐ 153" ☐ 155" ☐ 157" ☐ 159" ☐ 161" ☐ 163" ☐ 165" ☐ 167" ☐ 169" ☐ 171" ☐ 173" ☐ 175" ☐ 177" ☐ 179" ☐ 181" ☐ 183" ☐ 185" ☐ 187" ☐ 189" ☐ 191" ☐ 193" ☐ 195" ☐ 197" ☐ 199" ☐ 201" ☐ 203" ☐ 205" ☐ 207" ☐ 209" ☐ 211" ☐ 213" ☐ 215" ☐ 217" ☐ 219" ☐ 221" ☐ 223" ☐ 225" ☐ 227" ☐ 229" ☐ 231" ☐ 233" ☐ 235" ☐ 237" ☐ 239" ☐ 241" ☐ 243" ☐ 245" ☐ 247" ☐ 249" ☐ 251" ☐ 253" ☐ 255" ☐ 257" ☐ 259" ☐ 261" ☐ 263" ☐ 265" ☐ 267" ☐ 269" ☐ 271" ☐ 273" ☐ 275" ☐ 277" ☐ 279" ☐ 281" ☐ 283" ☐ 285" ☐ 287" ☐ 289" ☐ 291" ☐ 293" ☐ 295" ☐ 297" ☐ 299" ☐ 301" ☐ 303" ☐ 305" ☐ 307" ☐ 309" ☐ 311" ☐ 313" ☐ 315" ☐ 317" ☐ 319" ☐ 321" ☐ 323" ☐ 325" ☐ 327" ☐ 329" ☐ 331" ☐ 333" ☐ 335" ☐ 337" ☐ 339" ☐ 341" ☐ 343" ☐ 345" ☐ 347" ☐ 349" ☐ 351" ☐ 353" ☐ 355" ☐ 357" ☐ 359" ☐ 361" ☐ 363" ☐ 365" ☐ 367" ☐ 369" ☐ 371" ☐ 373" ☐ 375" ☐ 377" ☐ 379" ☐ 381" ☐ 383" ☐ 385" ☐ 387" ☐ 389" ☐ 391" ☐ 393" ☐ 395" ☐ 397" ☐ 399" ☐ 401" ☐ 403" ☐ 405" ☐ 407" ☐ 409" ☐ 411" ☐ 413" ☐ 415" ☐ 417" ☐ 419" ☐ 421" ☐ 423" ☐ 425" ☐ 427" ☐ 429" ☐ 431" ☐ 433" ☐ 435" ☐ 437" ☐ 439" ☐ 441" ☐ 443" ☐ 445" ☐ 447" ☐ 449" ☐ 451" ☐ 453" ☐ 455" ☐ 457" ☐ 459" ☐ 461" ☐ 463" ☐ 465" ☐ 467" ☐ 469" ☐ 471" ☐ 473" ☐ 475" ☐ 477" ☐ 479" ☐ 481" ☐ 483" ☐ 485" ☐ 487" ☐ 489" ☐ 491" ☐ 493" ☐ 495" ☐ 497" ☐ 499" ☐ 501" ☐ 503" ☐ 505" ☐ 507" ☐ 509" ☐ 511" ☐ 513" ☐ 515" ☐ 517" ☐ 519" ☐ 521" ☐ 523" ☐ 525" ☐ 527" ☐ 529" ☐ 531" ☐ 533" ☐ 535" ☐ 537" ☐ 539" ☐ 541" ☐ 543" ☐ 545" ☐ 547" ☐ 549" ☐ 551" ☐ 553" ☐ 555" ☐ 557" ☐ 559" ☐ 561" ☐ 563" ☐ 565" ☐ 567" ☐ 569" ☐ 571" ☐ 573" ☐ 575" ☐ 577" ☐ 579" ☐ 581" ☐ 583" ☐ 585" ☐ 587" ☐ 589" ☐ 591" ☐ 593" ☐ 595" ☐ 597" ☐ 599" ☐ 601" ☐ 603" ☐ 605" ☐ 607" ☐ 609" ☐ 611" ☐ 613" ☐ 615" ☐ 617" ☐ 619" ☐ 621" ☐ 623" ☐ 625" ☐ 627" ☐ 629" ☐ 631" ☐ 633" ☐ 635" ☐ 637" ☐ 639" ☐ 641" ☐ 643" ☐ 645" ☐ 647" ☐ 649" ☐ 651" ☐ 653" ☐ 655" ☐ 657" ☐ 659" ☐ 661" ☐ 663" ☐ 665" ☐ 667" ☐ 669" ☐ 671" ☐ 673" ☐ 675" ☐ 677" ☐ 679" ☐ 681" ☐ 683" ☐ 685" ☐ 687" ☐ 689" ☐ 691" ☐ 693" ☐ 695" ☐ 697" ☐ 699" ☐ 701" ☐ 703" ☐ 705" ☐ 707" ☐ 709" ☐ 711" ☐ 713" ☐ 715" ☐ 717" ☐ 719" ☐ 721" ☐ 723" ☐ 725" ☐ 727" ☐ 729" ☐ 731" ☐ 733" ☐ 735" ☐ 737" ☐ 739" ☐ 741" ☐ 743" ☐ 745" ☐ 747" ☐ 749" ☐ 751" ☐ 753" ☐ 755" ☐ 757" ☐ 759" ☐ 761" ☐ 763" ☐ 765" ☐ 767" ☐ 769" ☐ 771" ☐ 773" ☐ 775" ☐ 777" ☐ 779" ☐ 781" ☐ 783" ☐ 785" ☐ 787" ☐ 789" ☐ 791" ☐ 793" ☐ 795" ☐ 797" ☐ 799" ☐ 801" ☐ 803" ☐ 805" ☐ 807" ☐ 809" ☐ 811" ☐ 813" ☐ 815" ☐ 817" ☐ 819" ☐ 821" ☐ 823" ☐ 825" ☐ 827" ☐ 829" ☐ 831" ☐ 833" ☐ 835" ☐ 837" ☐ 839" ☐ 841" ☐ 843" ☐ 845" ☐ 847" ☐ 849" ☐ 851" ☐ 853" ☐ 855" ☐ 857" ☐ 859" ☐ 861" ☐ 863" ☐ 865" ☐ 867" ☐ 869" ☐ 871" ☐ 873" ☐ 875" ☐ 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HOISTING AND CONVEYING EQUIPMENT

Cleveland Crane & Engrg. Co., Wickliffe, Ohio

HOISTS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.

HOISTS, Chain, Etc.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

HOISTS, Electric

Philadelphia Gear Works Inc., Erie Ave. and G St., Philadelphia, Pa.

HONING MACHINES, External

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Sunnens Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

HONING MACHINES, Internal (Cylinder)

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sunnens Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

HONING STONES

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio
Moline Tool Co., 102 20th St., Moline, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.

HONING TOOLS AND FIXTURES

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Fulmer, C. Allen, Co., 1231 First National Bank Bldg., Cincinnati 2, Ohio
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Sunnens Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

HOSE, Leather, Rubber, Metallic, Etc.

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

HYDRAULIC MACHINERY Tools and equipment

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Corp., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio
Erie Foundry Co., Erie, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.

Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

HYDRAULIC POWER UNITS OR TOOL HEADS

Barnes Drill Co., 814 Chestnut, Rockford 3, Ill.
Barnes, John S., Corp., Rockford, Ill.
Barnes, W. F. & John Co., 201 S. Waterford St., Rockford, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

INDEXING AND SPACING EQUIPMENT

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio

INDICATORS, Dial

Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDICATORS, Speed

Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDICATORS, Test

Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Micrometrical Mfg. Co. (Surface roughness & waviness), 321 S. Main St., Ann Arbor, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDUCTION HEATING EQUIPMENT

Gen. Al Electric Co., Schenectady, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio

INTENSIFIERS, Hydraulic

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio
Hydro-Line Mfg. Co., 5764 Pike Rd., Rockford, Ill.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

JACKS, Machine Leveling

Enterprise Mch. Parts Corp., Detroit, Mich.

JACKS, Planer

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

JIG BORER

See Boring Machines, Jig

JIGS AND FIXTURES

Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, Ill.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
National Broach & Machine Co., 5600 St. Jean St., Detroit 13, Mich.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

JOINTS

See Fittings, Hydraulic, Pneumatic, Etc.

KEYS, Woodruff, Machine, Special

Standard Automotive Parts Co., 660-668 Nims St., Muskegon, Mich.

KEYSEATERS

Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio
Consolidated Mch. Tool Co., Rochester, N. Y.
Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Mitte & Merrill, 68 Holden St., Saginaw, Mich.

KNURL HOLDERS

Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.

KNURLING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

LAPPING MACHINES

Barnes Drill Co. (Straight Line or Rotating), 814 Chestnut St., Rockford, Ill.
Cincinnati Grinders, Inc. (Centerless), Cincinnati, Ohio
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill. (Lapmaster Div.)
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

LAPPING PLATES, Hand

Crane Packing Co., 1800 Cuyler Ave., Chicago.
Hirschmann Co., Carl, 30 Park Ave., Manhasset, N. Y.

LATHE AND GRINDING DOGS

Armstrong Bros. Tool Co. 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

LATHE ATTACHMENTS

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio
Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Los Angeles 58, Cal.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Jones & Lamson Mch., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sidney Machine Tool Co., Sidney, Ohio
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio

LATHES, Automatic

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLesseuw Mch. Co., Kensington, Conn.
Hydra-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K. Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio
National Acme Co., 170 E. 131st St., Cleveland, Ohio
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Axle

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Bench

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Boring

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Sidney Machine Tool Co., Sidney, Ohio

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio

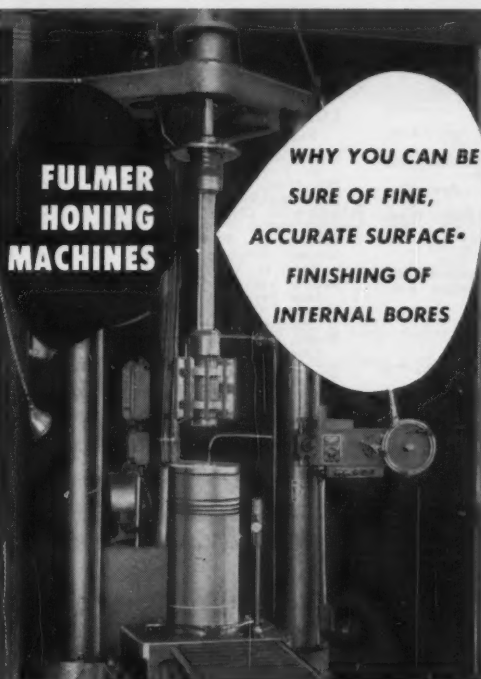
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Double-End

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Duplicating

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Hydro-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio
Sidney Machine Tool Co., Sidney, Ohio
(Continued on page 338)



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end cylinders, hydraulic
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American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio
 Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
 Barber-Colman Co. (Hendey Mch. Div.) Rockford, Ill.
 Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio
 Consolidated Mch. Tool Corp., Rochester, N. Y.
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
 Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
 Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
 Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio
 Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio
 Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
 Pratt & Whitney, West Hartford 1, Conn.
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
 Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
 Seneca Falls Mch. Co., Seneca Falls, N. Y.
 Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
 Sidney Machine Tool Co., Sidney, Ohio
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
 Springfield Mch. Tool Co., Springfield, Ohio

LATHES, Gap

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
 Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio
 Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
 Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
 Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio
 Seneca Falls Mch. Co., Seneca Falls, N. Y.
 Sidney Machine Tool Co., Sidney, Ohio
 Springfield Mch. Tool Co., Springfield, Ohio
 Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio

LATHES, Gun

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
 Consolidated Mch. Tool Corp., Rochester, N. Y.
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
 Seneca Falls Mch. Co., Seneca Falls, N. Y.
 Springfield Machine Tool Co., Springfield, Ohio

LATHES, Hollow Spindle

Axelson Mfg. Co., P.O. Box 15335, Vernon St., Los Angeles 58, Cal.
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
 Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Manufacturing Type

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
 Hydra-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
 Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
 Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio

LATHES, Spinning

Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio
 Ferracuta Machine Co., Bridgeton, N. J.

LATHES, Toolroom

See Lathes, Engine and Toolroom

LATHES, Turret

Bardons & Oliver Inc., Ft. W. 9th St., Cleveland 13, Ohio
 Brown & Sharpe Mfg. Co., Providence, R. I.
 Bullard Co., Brewster St., Bridgeport 2, Conn.
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
 Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
 Hardinge Brothers, Inc. (Bench or Cabinet Mounting), 1418 College Ave., Elmira, N. Y.
 Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio
 Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
 Potter & Johnson Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
 Springfield Mch. Tool Co., Springfield, Ohio
 Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio

LATHES, Vertical Turret

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio
 Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
 Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio
 Bullard Co., Brewster St., Bridgeport 2, Conn.
 Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.

LAYOUT FLUID

Dykem Co., 2303 P. North 11th St., St. Louis 6, Mo.

LEVELS

Bullard Co., Brewster St., Bridgeport 2, Conn.
 Lufkin Rule Co., Hess Ave., Saginaw, Mich.
 Millers Falls Co., Greenfield, Mass.
 Pratt & Whitney, West Hartford 1, Conn.
 Starrett, The L. S. Co., Athol, Mass.
 Taft-Peirce Mfg. Co., Woonsocket, R. I.

LUBRICANTS, Including Extreme**Pressure (EP) Machinery Lubricants**

Cities Service Oil Co., 70 Pine St., New York, N. Y.
 Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
 Lubriplate Div., Fiske Bros. Refining Co., 120 Lockwood St., Newark 5, N. J.
 Shell Oil Co., 50 W. 50th St., New York, N. Y.
 Sinclair Refining Co., 600 5th Ave., New York, N. Y.
 Socony Vacuum Oil Co., Inc., 26 Broadway, New York, N. Y.
 Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
 Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
 Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
 Texas Co., 135 E. 42nd St., New York, N. Y.
 White & Bagley Co., Worcester, Mass.

LUBRICATING SYSTEMS

Farval Corp., 3249 E. 80th St., Cleveland, Ohio
 Madison-Kipp Corp., Madison, Wis.
 Norgren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo.
 Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

MACHINISTS' SMALL TOOLS

See Calipers, Hammers, Wrenches, Drills, Taps, Etc.

MAGNETIC BASES FOR INDICATORS

du Mont Corp., Greenfield, Mass.

MANDRELS

See Arbors and Mandrels.

MARKING MACHINES AND DEVICES

Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit, Mich.

MEASURING MACHINES AND INSTRUMENTS, Precision

Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio
 Crane Packing Co., 1800 Cuyler Ave., Chicago
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
 Federal Products Corp., P.O. Box 1027, Providence, R. I.
 Lufkin Rule Co., Hess Ave., Saginaw, Mich.
 Max Wyler, 611 W. 43rd St., New York 36, N. Y.
 Norma-Hoffman Bearings Corp., Stamford, Conn.
 Pratt & Whitney, West Hartford 1, Conn.
 Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

Starrett, The L. S. Co., Athol, Mass.
 Taft-Peirce Mfg. Co., Woonsocket, R. I.
 Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MEASURING WIRES, THREAD, SPLINE AND GEAR

Taft-Peirce Mfg. Co., Woonsocket, R. I.
 Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

METAL, Bearings

See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.,

METAL FINISHINGS

Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.

METERS

See Recording Instruments

MICROMETERS

Ames, B. C., Co. (Dial), Waltham 54, Mass.
 Brown & Sharpe Mfg. Co., Providence, R. I.
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
 Lufkin Rule Co., Hess Ave., Saginaw, Mich.
 Millers Falls Co., Greenfield, Mass.
 Pratt & Whitney, West Hartford 1, Conn.
 Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
 Starrett, The L. S. Co., Athol, Mass.
 Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MICROSCOPES, Toolmakers

Scherr George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

MILLING ATTACHMENTS

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
 Brown & Sharpe Mfg. Co., Providence, R. I.
 Cincinnati Milling Machine Co., Cincinnati, Ohio
 Consolidated Machine Tool Corp., Rochester, N. Y.
 Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
 Kearney & Trecker Corp., Milwaukee, Wis.
 Pratt & Whitney, West Hartford 1, Conn.
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
 Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
 Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
 Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING AND CENTERING MACHINES

Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
 Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt.
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Automatic

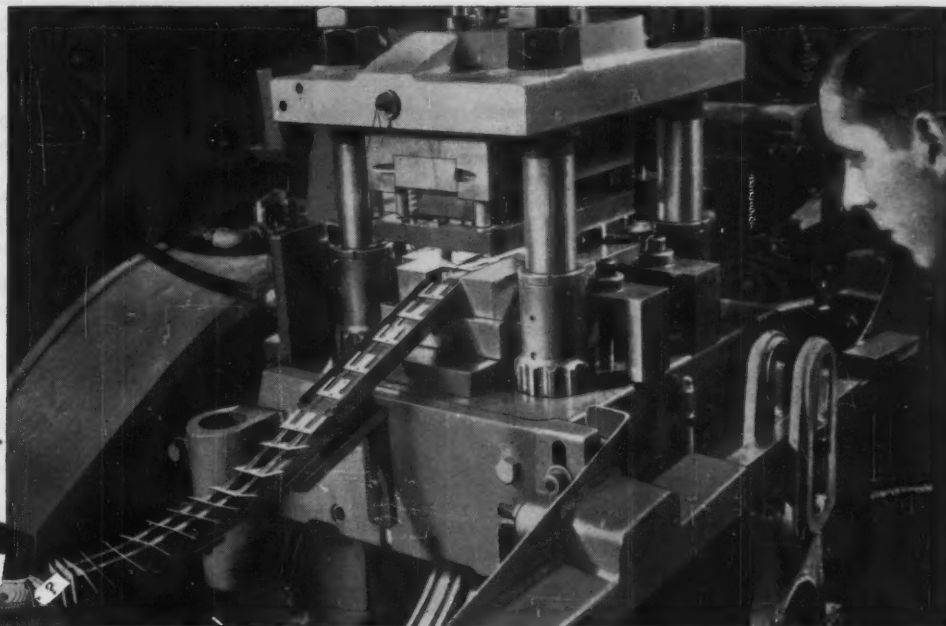
Cincinnati Milling Machine Co., Cincinnati, Ohio
 Consolidated Machine Tool Corp., Rochester, N. Y.
 Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
 Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
 Kearney & Trecker Corp., Milwaukee, Wis.
 Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
 Pratt & Whitney, West Hartford 1, Conn.
 Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
 U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Bench

Hardinge Bros., Inc. (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y.
 Pratt & Whitney, West Hartford 1, Conn.
 U. S. Burke Machine Tool Div., Brotherton Rd., Cincinnati 27, Ohio.

(Continued on page 340)

Photo courtesy Magnetic Metals Co. shows automatic production of power transformer laminations with DIE-CARB dies.



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- Low regrinding cost.
- Greater production per die life.

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MACHINERY, August, 1955—339

MILLING MACHINES, Circular, Continuous

Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Espan-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espan-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Hand

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
U. S. Burke Machine Tool Div., Brotherton Rd., Cincinnati 27, Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Horizontal, Plain and Universal

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Planer Type

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espan-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn. R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.

Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Ram Type Universal

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Turret Type

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Bridgeport Machines, Inc., Linley Ave., Bridgeport, Conn.

MILLING MACHINES, Vertical

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, Ill.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Burke Machine Tool Div., Cincinnati 27, Ohio.

MODEL AND EXPERIMENTAL WORK
See Special Machinery and Tools**MOLD AND DIE COPYING MACHINES**

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Turchan Follower Machine Co., 8259 Liveraio & Alaska Aves., Detroit, Mich.

MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Erie Foundry Co., Erie, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Rockford Machine Tool Co., 2500 Klswaukee St., Rockford, Ill.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Howell Electric Motors Co., Howell, Mich.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

MOTORS, Hydraulic

Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MULTIPLE-SLIDE FORMING MACHINES

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

NIBBLING MACHINES

International Nickel Co., Inc., 67 Wall St., New York, N. Y.
Wales-Strippet Corp., North Tonawanda, N. Y.

NIPPLE THREADING MACHINERY

Landis Machine Co., Inc., Waynesboro, Pa.

NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, Ill.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.
Union Drawn Steel Co., Div., Republic Steel Corp., Massillon, Ohio.

NUTS, Self-locking

Grip Nut Co., 310 S. Michigan Ave., Chicago 4, Ill.

NUTS, Thumb or Wing and Cap

Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

OIL EXTRACTORS AND CLEANERS

De Laval Separator Co., Poughkeepsie, N. Y.

OIL GROOVERS

Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.

OIL SEALS

Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

OILERS AND LUBRICATORS

Madison-Kipp Corp., Madison, Wis.

OILS, Cutting

See Cutting and Grinding Fluids.

OILS, Lubricating

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 5th Ave., New York.
Socony Vacuum Oil Co., Inc., 26 Broadway, New York, N. Y.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

OILS, Quenching and Tempering

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 5th Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.

O-P

OILS, Soluble

See Compounds, Cutting, Grinding, Metal Drawing, Etc.

OPTICAL FLATS

Crane Packing Co., 1800 Cuyler Ave., Chicago.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

ORDNANCE MACHINES, Special

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.

Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, Ill.
Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.

PAINTING EQUIPMENT, Spray

Lowe Bros. Co., Dayton, Ohio.

PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Storrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

PILLOW BLOCKS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

PIPE, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y.
Mueller Brass Co., Port Huron 35, Mich.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

PIPE, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
United States Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

PIPE THREADING AND CUTTING MACHINES

Landis Machine Co., Inc., Waynesboro, Pa.

PIPE TONGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

PLANNER ATTACHMENTS

Consolidated Mch. Tool Corp., Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn R. R. Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

Product Directory

PLANERS

Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

PLANERS, Double Housing and Openside

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio (Plate).
Consolidated Mch. Tool Corp. (Incl. Plate, Rotary and Crank Types), Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A. Co., Woodburn Ave., and Penn R. R. Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

PLATE ROLLS

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

PLATES, Angle

Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.

PLATES, Surface

Brown & Sharpe Mfg. Co., Providence, R. I.
Brush Electronics Co., 3405 Perkins Ave., Cleveland, Ohio.
Challenge Machinery Co., Grand Haven, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Pratt & Whitney Div., West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

PNEUMATIC EQUIPMENT

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Onsrud Machine Works Inc., 3940 Palmer St., Chicago, Ill.

POLISHING LATHES AND MACHINES

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Millers Falls Co., Greenfield, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POLISHING TOOLS, Portable

Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POWER UNITS, Hydraulic

See Hydraulic Power Units or Tool Heads

PRESSES, Arbor

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
duMont Corp., Greenfield, Mass.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Lempco Products, Inc., 5490 Durham Rd., Bedford, Ohio.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Threadwell Tap & Die Co., Greenfield, Mass.
Tomkins-Johnson Co., 614 No. Mechanic St., Jackson, Mich.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.
(Continued on page 342)



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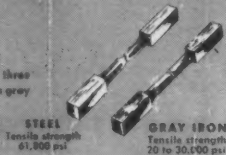
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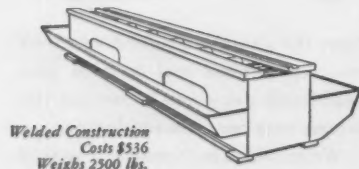
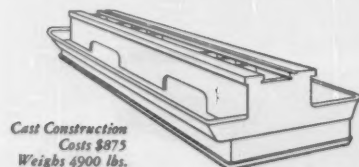


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PRESSES, Broaching

American Broach & Mch. Co., Ann Arbor, Mich.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.

PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.

PRESSES, Forging

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, Ill.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PRESSES, Hydraulic

American Broach & Mch. Co., Ann Arbor, Mich.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co. (Hydroform), Cincinnati 9, Ohio.
Cincinnati Milling Mch. Co. (Hydroform), Cincinnati 9, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, Ill.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit, Mich.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Detroit Broach Co., (special & semi-special) P. O. Box 156, Rochester, Mich.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Federal Mch. & Welder Co., Warren, Ohio.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Lempco Products, Inc., 5490 Durham Rd., Bedford, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

PRESSES, Screw

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.

PRESSES, Sheet Metal Working

Allen, Alva F., Box 426, Clinton, Mo. (Bench)
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cincinnati Milling Mch. Co. (Hydroform), Cincinnati 9, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, Ill.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 50, Ill.
Erie Foundry Co., Erie, Pa.
Espan-Lucas Machine Works, Front St., and Girard Aves., Philadelphia, Pa.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wales-Strippert Corp., North Tonawanda, N. Y.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Corp., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lempco Products, Inc., 5490 Durham Rd., Bedford, Ohio.
Niagara Machine & Tool Works (Hydraulic), 683 Northland Ave., Buffalo, N. Y.
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Allsteel Press Co., 93rd St. & Kenwood Ave., Chicago, Ill.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PROFILE—TRACING ATTACHMENTS

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa. (Lathe).

P-R

PROFILING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Casa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George Machine Co., 1110 W. 13th St., Racine, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co., Providence, R. I.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tompkins-Johnson Co., Jackson, Mich.
Vickers Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

PUMPS, Rotary

Brown & Sharpe Mfg. Co., Providence, R. I.
Pioneer Pump Div., Detroit Harvester Co., 14300 Tireman Ave., Detroit 28, Mich.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

PUNCHES, Centering

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

Product Directory

PUNCHING MACHINERY

Allen, Alva F., Box 426, Clinton, Mo.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Engineering & Research Corp., Riverdale, Md.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Joseph T., & Son Inc., 2558 W. 16th St., Chicago 18, Ill.
Version Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Wales-Strippert Corp., North Tonawanda, N. Y.
Wiedermann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

RACKS, Gear Cut

Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

REAMER HOLDERS

Lipe-Railway Corp., 806 Emerson Ave., Syracuse, N. Y.

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

REAMERS

The Atrax Co. (Carbide), 240 Day St., Newington 11, Conn.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 27, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Jarvis Corp., Middletown, Conn.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio.
Lipe-Railway Corp., 806 Emerson Ave., Syracuse, N. Y.
Mohawk Tools, Inc., 910 E. Main St., Montpelier, Ohio.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

(Continued on page 344)

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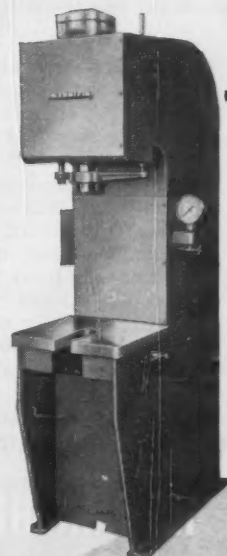
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Barber-Colman Co., Rock and Montague, Rockford, Ill.
Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
McCroskey Tool Corp., 1938 Thomas St., Meadville, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Taff-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMERS, Taper Pin

The Atrax Co. (Carbide), 240 Day St., Newington 11, Conn.
Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Railway Corp., 806 Emerson Ave., Syracuse, N. Y.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

REAMING MACHINES

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Kaufman Manufacturing Co., Manitowoc, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

RECORDING INSTRUMENTS

National Acme Co. (for counting), 170 E. 131st St., Cleveland, Ohio.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

REELS, Stock, Standard and Automatic

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

REFRACTORS, Heat-Treating Furnace

Norton Co., 1 New Bond St., Worcester 6, Mass.

REGULATORS, Temperature

General Electric Co., Schenectady, N. Y.

REMOVERS, Japan, Enamel, Etc.

Oakite Products, Inc., 19 Rector St., New York, N. Y.

RETAINING RINGS FOR BEARINGS, Etc.

Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Waldes-Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

RHEOSTATS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

RIVET SETS

Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

RIVETERS, Hydraulic

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.

RIVETERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Ingersoll-Rand Co., Phillipsburg, N. J.
Ryersen, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Wood & Co., R. D. Public Ledger Bldg., Philadelphia, Pa.

RIVETING MACHINES

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Tomkins-Johnson Co., Jackson, Mich.

RIVET MAKING MACHINES

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

RUBBER PRODUCTS

Garlock Packing Co., Palmyra, N. Y.

RULES, Steel

Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S. Co., Athol, Mass.

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Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Parker Rust Proof Co., 2194 E. Milwaukee, Detroit 11, Mich.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAND BLAST EQUIPMENT

See Blast Cleaning Equipment

SANDERS

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

SAW BLADES, Hack

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DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S. Co., Athol, Mass.

SAW SHARPENING MACHINES

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Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

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Coca Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Wallace Tube Co., (Abrasive) 1304-08 Diversey PKWY., Chicago 14, Ill.

SAWING MACHINES, Friction

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

SAWING MACHINES, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Grab, Inc., Grafton, Wis.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

SAWING MACHINES, Power Hack

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Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Ryerson Joseph T., & Son Inc., 2558 W. 16th St., Chicago 18, Ill.

SAWS, Circular Metal Cutting

Brown & Sharpe Mfg. Co., Providence, R. I.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Consolidated Mch. Tool Corp., Rochester, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Johnson Mfg. Co., Albion, Mich.
Espin-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Match & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Twist Drill & Tool Co., & Winter Bros., & Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

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Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.

SAWS, Portable Electric

Millers Falls Co., Greenfield, Mass.

SAWS, Screw Slotting

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

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Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

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Ingersoll-Rand Co., Phillipsburg, N. J.

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Ingersoll-Rand Co., Phillipsburg, N. J.

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Brown & Sharpe Mfg. Co., Providence, R. I.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.

Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnson Co., 1027 Newport Ave., Pawtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
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Mueller Brass Co., Port Huron 35, Mich.
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Ottemiller, M. H., Co., York, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.

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Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINES, Hand

See also Lathes, Turret
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Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

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Chicago Screw Co., Bellwood, Ill.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
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Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y.

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(Continued on page 346)

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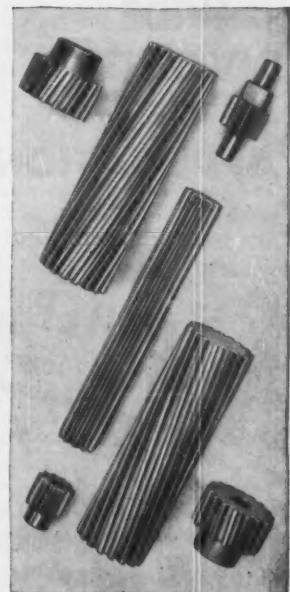
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De Laval Separator Co., Poughkeepsie, N. Y.
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Jarvis Corp., Middletown, Conn.
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Standard Pressed Steel Co., Jenkintown, Pa.

SHAFTS, Hollow-Bored

Bethlehem Steel Co., Bethlehem, Pa.

SHAFTS, Turned and Ground

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Cumberland Steel Co., Cumberland, Md.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
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Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

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Barber-Colman Co. (Hendey Mch. Div.) Rockford, Ill.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Smith & Mills Shapers, Inc., Div. Hamilton-Thomas Corp., Hamilton, O.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

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Pratt & Whitney, West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

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U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div. Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

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Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
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Ferrocut Machine Co., Bridgeton, N. J.
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Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
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Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
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Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

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Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

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Laminated Shim Co., Inc., Glenbrook, Conn.

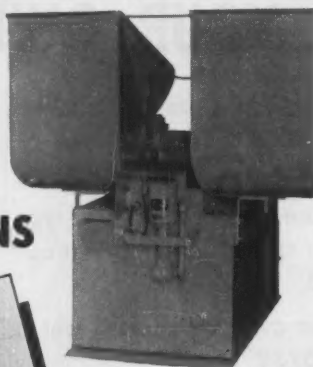
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Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
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Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
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Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
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Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenthuth 2, Mich.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
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General Electric Co., Schenectady, N. Y.
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Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
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(Continued on page 348)

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American Steel & Wire Co., Div. U. S. Steel
Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
National Forge & Ordnance Co., Irvine, Warren
County, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitch-
burg, Mass.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co.
Div., Carnegie-Illinois Steel Corp., Div., Co-
lumbia Steel Co., Div., Tennessee Coal, Iron
& R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheeler-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Cold Drawn

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel
Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co.,
Div., 436 7th Ave., Pittsburgh, Pa.
Wheeler-Lovejoy & Co., Inc., Cambridge,
Mass.

STEEL, High Speed Tool

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 Armstrong
Ave., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pitts-
burgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitch-
burg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheeler-Lovejoy & Co., Inc., Cambridge,
Mass.

STEEL, Machine

Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Wheeler-Lovejoy & Co., Inc., Cambridge,
Mass.

STEEL, Stainless

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel
Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co.
Div., Carnegie-Illinois Steel Corp., Div.), 436
7th Ave., Pittsburgh, Pa.
Wheeler-Lovejoy & Co., Inc., Cambridge,
Mass.

STEEL, Strip and Sheet

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel
Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
U. S. Steel Corp., (American Steel & Wire Co.
Div., Carnegie-Illinois Steel Corp., Div., Co-
lumbia Steel Co. Div., Tennessee Coal, Iron
& R. R. Co. Div.), 436 7th Ave., Pittsburgh,
Pa.

STEEL, Tool and Die

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitch-
burg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

STEEL ALLOYS

See Alloys, Steel

STEEL BARS

See Bars, Steel

STEEL STOCK GROUND FLAT

Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett, The L. S. Co., Athol, Mass.

STELLITE

Haynes Stellite Div., Union Carbide & Carbon
Corp. (Alloy), 30 E. 42nd St., New York,
N. Y.

STOCKS, Die

Armstrong Bros. Tool Co., 5200 W. Armstrong
Ave., Chicago, Ill.
Butterfield Div., Union Twist Drill Co., Derby
Line, Vt.
Card, S. W., Mfg. Co., Div. of Union Twist
Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., Greenfield, Mass.

STONES, Oil or Sharpening

Carborundum Co., Buffalo Ave., Niagara Falls,
N. Y.
Norton Co., 1 New Bond St., Worcester 6,
Mass.

STOOLS

Standard Pressed Steel Co., Jenkintown, Pa.

STRAIGHTEDGES

Starrett, The L. S. Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

STRAIGHTENERS, Flat Stock and Wire

U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.

STRAIGHTENING MACHINERY

American Steel Foundries, Elmes Engrg. Div.,
Paddock Rd. and Tennessee Ave., Cincinnati,
Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P.O. Box 37, Harper Sta.,
Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N.Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1,
N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buf-
falo, N. Y.
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Errington Mechanical Laboratory Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Procurier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

SUB-PRESSES

Waltham Machine Works, Newton St., Waltham, Mass.

SUPERFINISHING MACHINES

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

SURFACE CHECKING EQUIPMENT

Micrometrical Mfg. Co., 321 S. Main St., Ann Arbor, Mich.

SURFACE PLATES

See Plates, Surface

SWAGING MACHINES

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.
Lemert Engrg. Co., Inc., 210 E. Jefferson St., Plymouth, Ind.

SWITCHES

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Westinghouse Electric Corp., E. Pittsburgh, Pa.

TACHOMETERS

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

TANGS, Replaceable, Drill & Reamer

Nu-Tangs Inc., 1335 Bates St., Cincinnati, Ohio.

TAPER PINS, Standard

Chicago Screw Co., Bellwood, Ill.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Lempco Products, Inc., 5490 Dunham Rd., Bedford, Ohio.
Pratt & Whitney, West Hartford 1, Conn.

TAP HOLDERS

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
McCrosky Tool Co., 1938 Thomas St., Meadville, Pa.
Procurier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

TAPPING ATTACHMENTS AND DEVICES

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros. Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Etico Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Jarvis Corp., Middletown, Conn.
Leland-Gifford Co., 1425 Southbridge St., Worcester, Mass.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Procurier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

Product Directory

TAPPING MACHINES

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros. Inc., Station F, P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Challenge Mchry. Co., Grand Haven, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Procurier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

TAPPING MACHINES, Nut

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

TAPS

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Continental Tool Works, Div. Ex-Cell-O Corp., Detroit 32, Mich.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Jarvis Corp., Middletown, Conn.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Threadwell Tap & Die Co., Greenfield, Mass.

TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

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(Continued on page 350)

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 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
 Kaufman Manufacturing Co., Manitowoc, Wis.
 Landis Mch. Co., Waynesboro, Pa.
 Lees-Bradner Co., Cleveland, Ohio.
 Pratt & Whitney, West Hartford 1, Conn.
 Proconier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
 Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
 Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
 Taft-Peirce Mfg. Co., Woonsocket, R. I.

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 Eastern Mch. crew Corp., New Haven, Conn.
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
 Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
 Geometric Tool Co., Westville Station, New Haven 15, Conn.
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 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
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 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
 Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

THREAD GAGES

See Gages, Thread.

THREAD GRINDING MACHINES

See Grinding Machines, Thread

THREAD MILLING MACHINES

Coulter, James, Machine Co., Bridgeport 5, Conn.
 Lees-Bradner Co., Cleveland, Ohio.
 Pratt & Whitney, West Hartford 1, Conn.
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
 Waltham Machine Works, Newton St., Waltham, Mass.

THREAD ROLLING HEADS

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

THREAD ROLLING MACHINES

Landis Machine Co., Waynesboro, Pa.
 Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
 Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.

TIN AND TERNEPLATES

Bethlehem Steel Co., Bethlehem, Pa.
 U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
 Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
 Besley-Welles Corp., 20 N. Wacker Drive, Chicago 6, Ill.
 Carpenter Steel Co., Reading, Pa.
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
 Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
 du Mont Corp., Greenfield, Mass.
 Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
 Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
 Vanadium Alloys Steel Co., Latrobe, Pa.
 Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.
 Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOL BITS, Special Alloy

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
 Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
 Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
 Kennametal, Inc., Latrobe, Pa.
 Vanadium Alloys Steel Co., Latrobe, Pa.
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TOOL GRINDERS

See Grinding Machines for Sharpening, Turning and Planing Tools

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
 Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
 Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
 Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
 Portage Double Quick Tool Co., 1063 Sweitzer Ave., Akron 11, Ohio.
 R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
 Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill. (Turret)
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
 Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
 Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOLMAKERS' INSTRUMENTS

Ames, B. C., Co., Waltham 54, Mass.
 Brown & Sharpe Mfg. Co., Providence, R. I.
 Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
 Starrett, The L. S., Co., Athol, Mass.
 Taft-Peirce Mfg. Co., Woonsocket, R. I.

TOOL RESINS

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 Bethlehem Steel Co., Bethlehem, Pa.
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 Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.
 Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
 Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
 Vanadium Alloys Steel Co., Latrobe, Pa.

TOOLS, Carbide-Tipped

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
 The Atrax Co., (Carbide) 240 Day St., Newton 11, Conn.
 Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
 Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
 Colonial Broach Co., Detroit 13, Mich.
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
 Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
 Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
 Kennametal, Inc., Latrobe, Pa.
 McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
 Metal Carbides Corp., Youngstown, Ohio.

Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
 Union Twist Drill Co., Athol, Mass.
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
 Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
 Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

TOOLS, Lathe, Shaper and Planer

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
 Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
 Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
 Bullard Co., Brewster St., Bridgeport 2, Conn.
 Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
 du Mont Corp., Greenfield, Mass.
 Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
 Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
 Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
 Kennametal, Inc., Latrobe, Pa.
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
 Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.
 Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
 Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio.
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
 Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TRANSFER MACHINES, Automatic

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
 Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
 Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
 Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
 Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
 Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TRANSFORMERS

General Electric Co., Schenectady, N. Y.

TRANSMISSION, Variable Speed

Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
 Reliance Electric & Engrg. Co., 1047 Ivanhoe Rd., Cleveland 10, Ohio.
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Sillman St., Bridgeport 5, Conn.

TUBE FORMING AND WELDING MACHINES

Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
 Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

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 American Electric Fusion Corp., 2622 Diversey Ave., Chicago, Ill.
 Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

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 Mueller Brass Co., Port Huron 35, Mich.
 Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

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(Continued on page 352)



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National Tube Div. U. S. Steel Corp., 525 Wm.
Penn Place, Pittsburgh, Pa.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.

TWIST DRILLS

See Drills, Twist

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UNIVERSAL JOINTS

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Boston Gear Works, 3200 Main St., North
Quincy 71, Mass.
Gear Grinding Machine Co., 3901 Christopher
St., Detroit 11, Mich.

VALVE CONTROLS

Lehigh Foundries, Inc., 1500 Lehigh Dr.,
Easton, Pa.
Philadelphia Gear Works (Motorized), Erie Ave.
and G St., Philadelphia, Pa.

VALVES, Air

Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
Ill.
Hunt, C. B. & Son, Inc., 1911 E. Pershing St.,
Salem, Ohio.
Lehigh Foundries, Inc., 1500 Leigh Dr.,
Easton, Pa.
Rivett Lathe & Grinder Inc., Brighton, Boston
35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate,
Detroit, Mich.

VALVES, Hydraulic

American Steel Foundries, Elmes Engrg. Div.,
Paddock Rd. and Tennessee Ave., Cincinnati,
Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Danison Engrg. Co., 1160 Dublin St., Columbus
16, Ohio.
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Ill.
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Salem, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1,
N. Y.
Lehigh Foundries, Inc., 1400 Lehigh Dr.,
Easton, Pa.
Logansport Machine Co., Inc., 810 Center
Ave., Logansport, Ind.
Oilgear Co., 1569 W. Pierce St., Milwaukee,
Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois
& Alaska Aves., Detroit, Mich.
Vickers, Inc., 1402 Oakman Blvd., Detroit,
Mich.

VIBRATION INSULATION

American Felt Co., Glenville, Conn.

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Armstrong-Blum Mfg. Co., 5700 W. Blooming-
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Armstrong Bros. Tool Co., 5200 W. Armstrong
Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati
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Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
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Logansport Machine Co., Inc., 810 Center
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Producto Mch. Co., 990 Housatonic Ave.,
Bridgeport, Conn.
Skinner Chuck Co., 344 Church St., New
Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.

Universal Engineering Co., Frankenmuth 2,
Mich.
U. S. Burke Machine Tool Div., Brotherton Rd.
17, Cincinnati 27, Ohio.

VICES, Pipe

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Williams, J. H. & Co., 400 Vulcan St., Buffalo
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VICES, Planer and Shaper

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Cincinnati Shaper Co., Elan and Garrard Aves.,
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Rockford Mch. Tool Co., 2500 Kishwaukee St.,
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South Bend Lathe Works, Inc., 425 E. Madison
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General Electric Co., Schenectady, N. Y.

WASHERS, Lock

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Federal Mch. & Welder Co., Warren, Ohio.
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave.,
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Westinghouse Electric Corp., E. Pittsburgh, Pa.

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Federal Machine & Welder Co., Overland Ave.,
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Verson Allsteel Press Co., 93rd St. & S. Ken-
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American Steel & Wire Co., Div. U. S. Steel
Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
U. S. Steel Corp., (American Steel & Wire Co.
Div., Columbia Steel Co., Div., Tennessee
Coal, Iron & R. R. Co. Div.), 436 7th Ave.,
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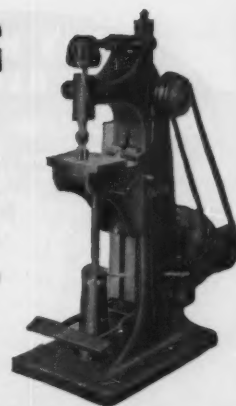
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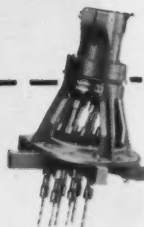
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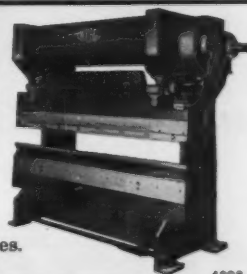
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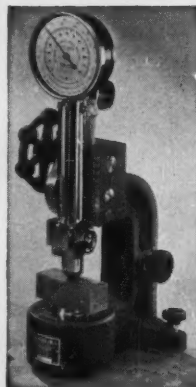
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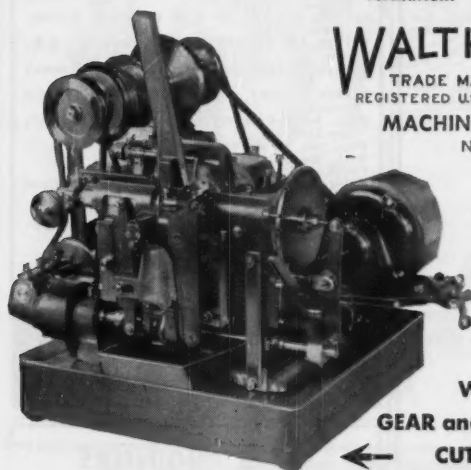
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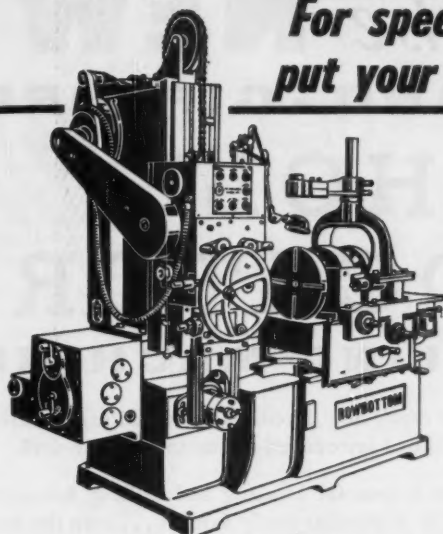
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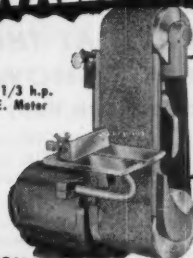
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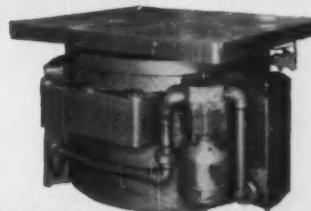
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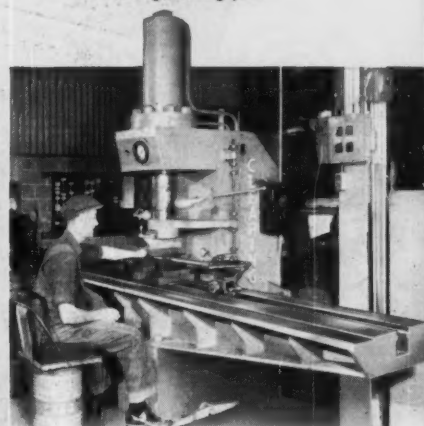
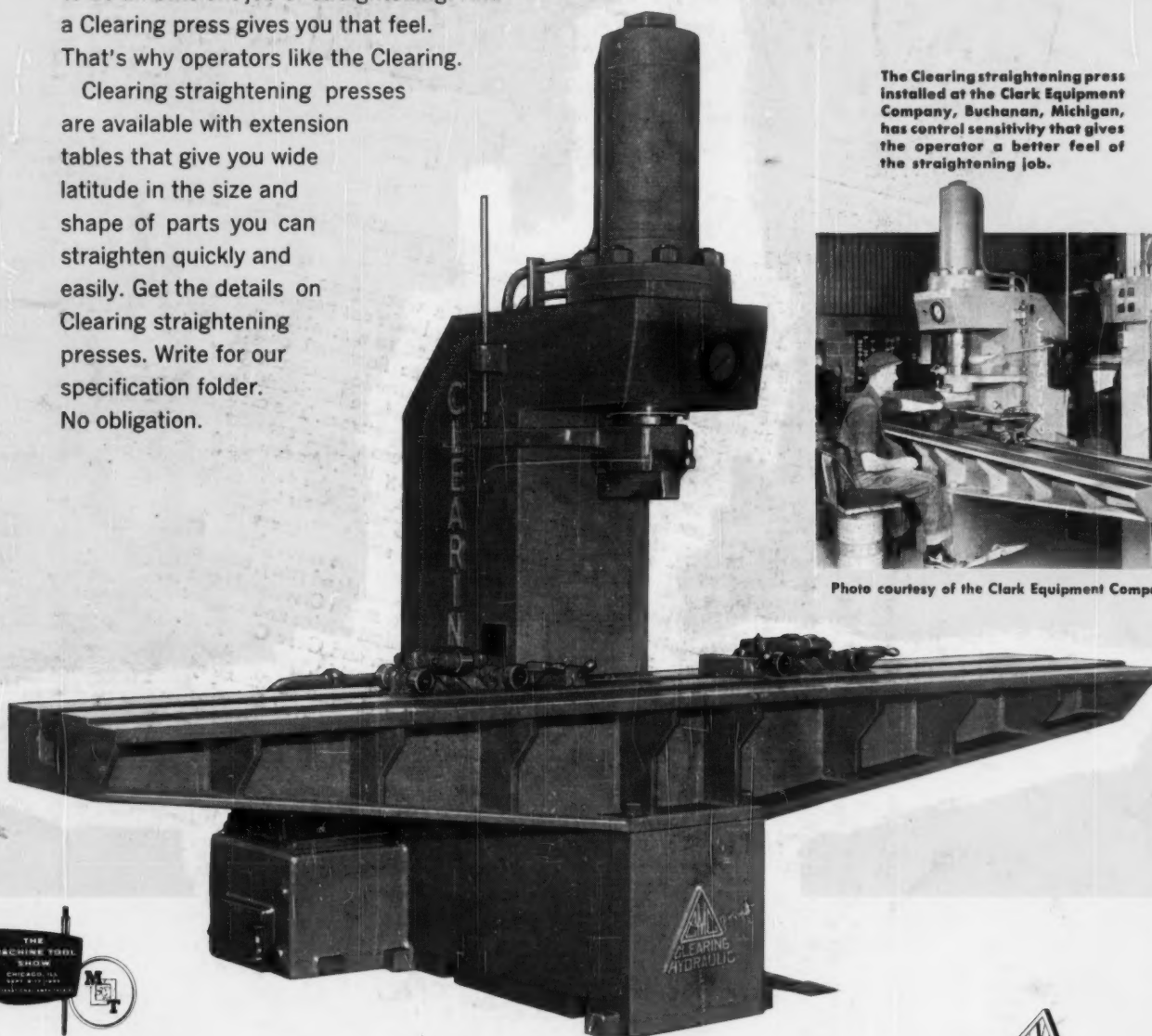


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